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EDITORIAL

The Manure Problem Basically, India is an agricultural country. Seventy to 80 per cent of her people directly or indirectly live on the land and have no other source of income, and the economy of the country may therefore be said to be based mainly on agriculture. It has been suggested at different times and more particularly recently, that the industrialisation of the country is a *prima facie* requisite to the improvement of her economic position. Notwithstanding this and without going into the question of the relative parts that could be played by agriculture and industry in the future, it could be categorically stated that there is considerable scope for improving the agricultural economy of the country by initiating certain programmes for the post-war period and implementing them steadfastly without any faltering.

The production from the land is primarily dependant on the soil, climate and facilities for irrigation and manuring. Though the soil and climate are factors over which no control is possible, much could be done by judicious manipulation of cropping and the various agricultural operations. The periodicity of the monsoons and the consequent prevalence of definite periods and seasons of wet and dry weather necessitate resorting to irrigation to tide over the uncertainties of rainfall. The rains are precarious in certain places and that would emphasise the need for expanding the existing sources of irrigation and construction of new irrigation projects wherever feasible.

The manurial problem in India requires the closest attention possible and study that the authorities and the cultivating class could devote. We do not belittle the importance of other problems, but manuring the land adequately with appropriate ingredients of plant-food is the biggest single problem in Agriculture, whose solution may well improve the agricultural economy of the country more than anything else. The progressive increase in the average yields of wheat in England illustrates the possibilites of what judicious fertilisation and farming methods can accomplish. The average yield of wheat was raised from 8 to 20 bushels per acre (one bushel is roughly 20 Madras measures), during the period 1740 to 1840 by the introduction of what is known as the Norfolk rotation, which includes two grain crops, turnips and clover, during a four-year period, combined with improvement of livestock, land reclamation and the use of farm yard

manure ; that is, by the adoption of improved agricultural practices all round. Chemical fertilisers came into use by about 1840 and by 1870, a period of 30 years, the average yield was increased to 30 bushels—an increase of 50 per cent and a difficult 50 per cent at that.

India is a tropical country and the organic matter of the soil is oxidised and lost at a rapid rate. The organic matter status of the soil, predetermines in a manner the production by influencing the chemical and biological changes that are going on incessantly in the soil, and the soil-water and plant relationship. All the organic refuse requires to be collected and converted into compost and made available for raising the organic matter content of the soil. Similarly cattle manure has also to be preserved properly, without allowing any portion to go to waste. Green manure crops have to be grown and incorporated in the soil and there is great scope for it. Green matter could be produced in unlimited quantities and fitting suitable green manure crops into the local rotation is possible in a large part of the country and without much of trouble.

Having provided all the organic matter required by the soil, attempts should be made to provide the manurial ingredients in which soils are lacking. Artificial fertilisers would have to fill up the gap. A large number of manurial experiments have been carried out in the Madras Presidency and the review of the manurial experiments, that is being published in this journal, indicates definitely that the South Indian soils are deficient mostly in nitrogen and phosphoric acid. Making available artificial fertilisers to supply nitrogen and phosphoric acid in sufficient quantities and at economic rates to the agriculturists will have to devolve on enterprising manufacturers, and in the absence of such enterprise on Governmental agency to provide the necessary stimulus and if necessary to start such enterprises, in the early stages at least. The development of the sugar industry in the country is a case which provides an example of what such fostering State help can accomplish. The use of fertilisers in India is negligible, if we omit the coffee, tea and rubber plantations and the commercial crops like potato, plantain and sugarcane. Applying fertilisers has not been a common farming practice in India, mainly because of the high cost of fertilisers, as compared to the price of agricultural produce in general. The major problem may well be stated, therefore, to be the production of fertilisers cheaply and a reduction of overhead charges in their distribution. The cultivators are poor and their economy is of the hand-to-mouth type and catering to their needs might well tax the ingenuity of the authorities, but it has to be done. The present time may not be propitious ; shipping space and facilities are limited and neither much of fertilisers nor machinery for manufacturing them could be imported easily, though something may be possible even here to ease the present situation. But in post-war agricultural development programmes, the development of the manurial resources of the country and the production of cheap fertilisers will have necessarily to find a place and loom large in the picture.

A Review of the Manurial Experiments on the Agricultural Crops of the Madras Presidency for the Decennial Period 1930—40 (Contd.) *

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Dry Crops Manuring of crops grown under dry conditions has not received much attention because of its doubtful value, especially under restricted conditions of moisture and vagaries of season. The common dry land crops of the province are cotton and millets like *cholam, cumbu, tenai (korra)* confined mostly to the Ceded Districts ; while chillies, tobacco and groundnut are cultivated in Guntur. In the southern districts of Tinnevelly, Ramnad and South Arcot, *cumbu, cholam* and cotton are also raised as dry crops.

The manurial experiments on various crops are being carried out in the Agricultural Research Stations in these tracts, viz , Hagari, Nandyal, Guntur, Koilpatti and Palur. The results achieved during this ten year period are discussed below under the respective crops.

Cotton The experiments on the direct manurial effect of ammonium sulphate (2 cwt.) *plus* super (1 cwt.) per acre with and without a basal dressing of 5 cart-loads cattle manure were carried out for over three years at Guntur, Nandyal and Hagari with no consistent and reliable results in favour of the artificials. This has been due to the vagaries of season resulting either in the failure of the crop or the improper utilisation of the manures under limited moisture conditions. However, at Guntur, in two favourable years the fertilisers in combination with cattle manure have given an increase of 19 and 25 per cent in fields which were previously under *cholam*. At Nandyal similar experiments have shown the superiority of the combination of artificials with cattle manure which gave an increased yield of 16 per cent over no manure (258 lb kapas). In the year of application of cattle manure its effect is not at all felt except in combination with artificials. The manurial trials at Hagari on this crop with artificials, as well as compost and farm yard manure have not given significant increases in yields ; but the residual effects of the manures applied to the previous cereals, have been found beneficial.

Cattle manure (5 cart-loads per acre) and artificials (ammonium sulphate 2 cwt. plus super 1 cwt) applied individually and in combination to *cholam* at Nandyal have left their residual effects on the succeeding cotton crop and given an increased yield of 12, 26 and 38 per cent respectively over the control yield of 223 lb. kapas per acre, indicating the desirability of manuring cotton through the previous cereal crop In another course

* Continued from Vol. 32, p. 10.

of studies, cotton manured similarly was followed by *cholam* and subsequently by cotton. Residual effects were noted even in this second succeeding cotton crop and the corresponding increases were 11, 7 and 20 per cent over the no-manure plots. Incidentally it is seen that the residual effects are more lasting in the case of cattle manure when compared to artificials. Similarly at Hagari artificials applied to the *cholam* crop showed residual effects on the succeeding cotton crop in two out of three years with 38 per cent increase over control (202 lb. kapas).

The residual value of composts and farm yard manure applied at 50 lb. level of nitrogen to the previous crop of *korra* have increased the yields of the succeeding cotton by 2 and 11 per cent respectively. Where *cholam* was the previous manured crop, the corresponding increases were 36 and 32 per cent. Between the two manures no difference is observed.

Intensive studies have been carried out at Koilpatti on black soils on the response of cotton to manures both direct and residual, of different types. Ammonium sulphate at 2 cwt. per acre in one, two or three instalments at varying intervals has not produced different effects. All of them increased the yield ; the increases observed were between 20 and 25 per cent over no manure (560 lb. kapas). Over a basal dressing of 6 cart-loads of cattle manure and 1 cwt. super per acre, ammonium sulphate at 2 cwt. or groundnut cake 250 lb *plus* ammonium sulphate 1 cwt. increased the yield of cotton by 30 per cent ; groundnut cake 500 lb. or groundnut cake 125 lb. *plus* ammonium sulphate 56 lb. or ammonium sulphate 1 cwt. increased the yield by about 17 per cent. With regard to the form of nitrogen applied no difference was observed, that is, between ammonium sulphate and groundnut cake.

The direct application of molasses at about 5 tons per acre in one year has given an increase of 46 per cent over the control. In another experiment wherein Parry's cotton fertiliser was tried at 1, 2 and 4 cwt. per acre the increases obtained were 15, 50 and 71 per cent respectively over the control yield of 330 lb. kapas.

Residual Effect of Manures on Cotton Experiments conducted to test the residual effect of ammonium sulphate (2 cwt. per acre) or groundnut cake (500 lb.) applied to the previous crop of *cumbu* or *cholam* over a basal dressing of 4 cart-loads cattle manure, *plus* 2 cart-loads cotton compost and 1 cwt super, per acre an increase of 15 to 30 per cent has been recorded over control (700 lbs kapas) In the case of residual effect of the manures on cotton in the second year, after cotton and *cumbu* or cotton and *cholam*, the increases noticed were 9 to 10 per cent over control yielding 700 lb. kapas per acre.

Cholam (1) *Direct Manuring :* Manurial trials on this rain-fed crop have been conducted at Guntur, Hagari, Nandyal and Koilpatti. As in the case of cotton, the effects of artificials, viz , ammonium sulphate (2 cwt.) and super (1 cwt.) per acre, in combination with and without a basal dressing

of 5 cart-loads of cattle manure, on the crop that was fertilised and on the succeeding crop were studied. The direct application of artificials has given significantly oetter yields with 67 per cent increase over cattle manure control (403 lb. grain per acre) during a four year trial at Guntur. In a similar experiment at Hagari but with the omission of cattle manure, the artificials by themselves have given consistently good results—72 per cent increase over control of 179 lb. grain—over a period of two years. At Nandyal, trials were carried out with cattle manure, cattle manure *plus* artificials, and artificals only for one, two and three years respectively. The artificials, with and without farm yard manure (5 cart-loads) have behaved alike with increased yields of 55 per cent over no manure yielding 445 lb. grain per acre; cattle manure by itself has given 14 per cent more.

Apart from these artificials, green manures of different types, viz. *pillipesara*, *teegapesara* and cowpea were tried for a period of 3 years with and without super at two levels (55 lb. and 84 lb, per acre.) on *pairu jonna* at Guntur. All the three green manures by themselves have increased the yields consistently in two out of three years by about 40 to 60 per cent over control (290 lb grain per acre), cowpea proving to be the best. The addition of super was not particularly advantageous in combination with these manures The application of molasses at 8 tons per acre at Hagari has resulted in very good yield, with more than 100 per cent increase over no manure control (318 lb. grain).

At Koilpatti, experiments were designed to study specially the effect of ammonium sulphate and groundnut cake individually and in combination with different levels of nitrogen to supply 50 lb to 70 lb. over a basal application of (1 cwt.) super *plus* 6 cart-loads cattle manure. The application of nitrogen either as cake, ammonium sulphate or a mixture of both has responded well when compared to control (210 lb. grain per acre) over a three year period. The maximum of 144 per cent. has been recorded for groundnut cake (500 lb.) closely followed by groundnut cake (250 lb) *plus* ammonium sulphate (1 cwt.), and ammonium sulphate (2 cwt) only with 123 and 133 per cent respectively. The other treatments with lower dose of nitrogen (50 lb. N.) have proved alike with increases ranging between 85 and 95 per cent.

In another experiment with a basal dressing of 2 cart-loads of cotton compost and 6 cart-loads of cattle manure per acre the effect of ammonium sulphate (2 cwt.) and groundnut cake (500 lb.) was tested. Along with the manures super also was applied at 1 cwt per acre. Both the manures have responded well with a phenomenal increase of 352 per cent for artificials and 266 per cent for groundnut cake over the yield of 500 lb. of grain per acre of the control treated with cattle manure and cotton compost only.

The influence of ammonium sulphate (2 cwt.) *plus* super (1 cwt.) when tested at Guntur for a period of 5 years on fodder *cholam* over a basal application of 5 cart-loads of cattle manure has proved extremely beneficial with an increase in the dry weight of fodder of 93 per cent over cattle manure control (3,652 lb. per acre).

(ii) *Indirect or Residual Effect of Manures* The residual effects of (2 cwt) ammonium sulphate plus super (1 cwt.) applied to cotton over a basal dressing of 5 cart-loads of cattle manure were tested both on *pairu jonna* (grain) and fodder over a period of two years at Guntur The artificials in combination with cattle manure responded better than cattle manure only, with increase of 20 and 16 per cent respectively over the corresponding control yields of 406 lb. grain and 3,568 lb. fodder. At Hagari also these artificials but without basal application of cattle manure have given significant increases in two out of three years over no manure. Similarly at Nandyal artificials and cattle manure applied to the previous crop showed their effect on the succeeding *cholam*, the increases being 58 and 46 per cent respectively over no manure control (350 lb. grain). The second year residual effect of these manures applied to *cholum* followed by cotton is also felt by the succeeding *cholam* in all cases with increases ranging between 10 and 18 per cent over no manure yielding 405 lb. grain per acre. The residual effect of ammonium sulphate (2 cwt) applied in one, two and three instalments to the previous cotton crop at varying intervals has been significant in two out of three years at Koilpatti Increases of 60 per cent were obtained for the two and three instalment applications and an increase of 30 per cent for the single application. Again significant results have been obtained consistently in two out of three years on the residual effects of ammonium sulphate and groundnut cake applied to the previous cotton crop at different levels of nitrogen—50 to 70 lb.—over a basal dressing of 6 cart-loads of cattle manure in presence of super. All the treatments except (1 cwt) ammonium sulphate, have responded well when applied individually and in combination, the best response was had for ammonium sulphate (2 cwt.) *plus* super (1 cwt) with an increase of 37 per cent over control cattle manure only.

Minor Millets Under dry land conditions only a limited number of experiments have been conducted on other millets of less economic importance in the Agricultural Research Stations of Guntur, Hagari, Koilpatti, and Nanjanad.

Tenai (*korra*) takes its place after *jonna* in importance and is cultivated mainly in the Ceded Districts and certain manurial experiments were done for a period of one to three years at Hagari. Indore compost and farm yard manure supplying 50 lb. nitrogen per acre were beneficial. The performances of both were alike with increases in yield ranging from 26 to 35 per cent over control (320 lb. grain per acre). In another experiment with farm yard manure at 3000, 6000, and 9000 lb. per acre, it was seen that the two higher doses gave good responses. The optimum dose was 6000 lb. with a percentage increase of 25 per cent over control (380 lb. grain).

Cumbu forms one of the important cereals of the southern districts of Tinnevelly and Ramnad. Manurial experiments were conducted on this crop at Koilpatti for a period of three years. The effects of the application of groundnut cake and ammonium sulphate at varying levels with 1 cwt. super

per acre were studied. A basal dressing of 6 cart-loads of cattle manure was given in all cases. All the treatments gave significant increases over the control ; 2 cwt. ammonium sulphate gave 123 per cent increase, 500 lb. groundnut cake 96 per cent, 250 lb. groundnut cake plus 112 lb ammonium sulphate 103 per cent, 125 lb. groundnut cake plus 56 lb. ammonium sulphate 64 per cent. 112 lb ammonium sulphate 74 per cent and 250 lb. groundnut cake 60 per cent. When ammonium sulphate (2 cwt) or groundnut cake (500 lb.) was applied with (1 cwt.) super and 4 cart-loads of cattle manure and 2 cart-loads of cotton compost, appreciable increases were obtained with both manures, ammonium sulphate proving the better of the two with 160 per cent increase over the control cattle manure.

Maize and Variga These crops were subjected to manurial experiments under dry conditions at Guntur for periods ranging from 2 to 4 years. Kossier phosphate and bone meal were applied to maize at 2 cwt. per acre over a basal dressing of 5 cart-loads cattle manure. Bone meal increased the yield by 22 per cent, but not the Kossier phosphate. The different types of green manures viz, *pillipesara*, *teegapesara* and cowpea applied with and without super at two different doses (56 and 86 lb. per acre) both on maize and *variga* gave significant results in favour of green manure and phosphate combination in two out of four years only. The green manures in general reacted better with super ; cowpea did better than others. The average increase in yield for cowpea—super combination is 47 per cent for maize and 57 per cent for *variga* over the corresponding controls of 468 and 414 lb respectively per acre.

Samai This is grown mainly in the Nilgris in rotation with potato and lupin. A number of experiments have been conducted on this crop both with artificials and organic manures. In an experiment to find out the behaviour of different forms of manure, organic and inorganic, and their best method of application, it was noted that ammonium sulphate (1 cwt. per acre) or niciphos (1½ cwt.) was as good as Nanjanad farm mixture* (3 cwt.) and better than no manure, the increases for the two treatments ranging between 12 and 15 per cent over the control yield of 783 lb. grain. Nanjanad mixture applied broadcast and covered with monsoon plough was significantly poorer than when incorporated either with Handy Andy Cultivator or applied in lines with drills. In another trial to find out the effect of ploughing in green manure lupin, at different stages of growth, it was noticed that the ploughing in of the crop at stray flowering stage was better than either at pod forming or maturing stage, the yields in the three cases being 850, 720 and 460 lb. of grain per acre respectively.

Residual Effects of Manures on the Minor Millets These experiments relate mainly to *cumbu* at Koilpatti and *samai* at Nanjanad.

Cumbu The residual effect of ammonium sulphate and groundnut cake applied individually and in combination with super (1 cwt.) to supply

* Containing groundnut cake 500 lb., ammonium sulphate 200 lb , steamed bonemeal 350 lb., concentrated super 336 lb., and sulphate of potash 224 lb.

50 lb. to 70 lb nitrogen over a basal dressing of 6 cart-loads of cattle manure to the previous cotton crop was tested on *cumbu* and found to increase the yield in one out of three years. The results are in favour of the higher dose of nitrogen, viz, ammonium sulphate (2 cwt), groundnut cake (500 lb.), and ammonium sulphate (1 cwt.) *plus* groundnut cake (250 lb.). The increases for these higher dosages range between 15 and 21 per cent over the control yield of 385 lb. of grain per acre for cattle manure. The second year residual effect of these manures, applied to the first crop *cumbu* or *cholam* followed by cotton has also been felt in the case of grain yield of the succeeding *cumbu* or *cholam*. The percentage yield increases for the two crops are 12 and 17 over the controls—303 and 340 lb. respectively.

Samai Certain potato manurial experiments were conducted at Nanjanad and the residual effects of the manures on the succeeding *samai* crop were tested. In one case two brands of potato fertilisers were compared with Nanjanad farm mixture. All these supplied nitrogen (1) either at 116 lb. per acre or (2) at 87 lb. per acre plus 5 tons cattle manure. There was no difference between the fertilisers as amongst themselves in their residual effects at either level. But the artificials only supplying 116 lb. nitrogen had significantly greater residual effects than artificials supplying 87 lb. nitrogen per acre *plus* 5 tons cattle manure. In the permanent manurial experiments the residual effects on *samai* of artificials, viz., nitrogen, phosphoric acid and potash applied individually and in combination with additions of lime and cattle manure alone or together, were noted for about two years, that is, after the main and second crop potato. The conclusions arrived at are (1) The response to nitrogen is not felt when applied alone or in combination with lime or cattle manure or a mixture of both, but with potash or potash *plus* phosphoric acid the yield is appreciably increased ; nitrogen *plus* phosphate giving 214 per cent and nitrogen *plus* potash *plus* phosphoric acid giving 180 per cent over the control no manure. (ii) Application of phosphate by itself is better than nitrogen alone. (iii) The complete artificials (N *plus* K *plus* P) with cattle manure or lime are better than when applied alone. (iv) No significant difference is observed between the cattle manure and lime plots. (v) A full combination of artificials with lime *plus* cattle manure is not better than artificials plus lime only.

TABLE X. Generel Mean Acre Yields of Samai *

	Yield of *samai* in lb. per acre after	
	main crop of potato	the second crop
Artificials only	645	818
Do. *plus* cattle manure	834	1,006
Do. *plus* lime	960	984
Do. *plus* cattle manure *plus* lime	950	957

* Treatments for potato are furnished in table XV.

Groundnut The effect of an application of 5 cartloads of cattle manure were noted on local spreading and bunch varieties of groundnut at Nandyal. The manure responded well in the case of the local spreading variety only during one out of two years with an increased yield of 28 per cent over control 1,360 lb. pods per acre.

Tobacco The effect on tobacco of the following artificials singly and in combination—ammonium sulphate at 1 cwt., sulphate of potash at 50 lb, and super at 1 cwt per acre, and at double these rates with and without a basal dressing of cattle manure was studied. The basal dressing of cattle manure was done in two ways—12 tons per acre for a three year period and at 4 tons per acre every year during all the three years and there was no difference between the two methods. The artificials in double doses were significantly better than the corresponding single doses. The greatest increase in yield was obtained with the combination of nitrogen *plus* potash *plus* phosphate—13 and 22 per cent over the corresponding controls in the single and double doses. Green manures—*pillipesara*, *teegapesara* and cowpea were applied to tobacco with and without super. There was no difference as between the green manures. The increases brought about by green manures were not consistent, though significant increases were noted here and there.

Chillies Experiments were carried out to study the effect of artificials and green manures on chillies just in the same manner as on tobacco (see above). Here also the artificials in double doses were distinctly better than single dose in all the combinations. Even in the single dose artificials supplying the manurial ingredients singly and in combination with and without cattle manure at four cart-loads applied annually have responded well. The application of 12 cart-loads of cattle manure initially was of no advantage over 4 cart-loads every year. The trials with green manures by themselves show that they do not do so well as no manure. But in combination with super only, cowpea has given significant increases in yield.

Pepper The cultivation of pepper is restricted to the hilly tracts of Malabar and the manurial experiments on this crop have been few. Being a perennial crop it is rather very difficult to assess correctly its manurial needs at the various stages of growth. The results of the experiments done are liable to be masked by such factors as (i) original age and variety of the crop, (ii) nature of standard and shade effect, (iii) surface washes on steep slopes, (iv) disease infection, woody spike, e g., (v) season, etc. All the same, the following indications are had from a scrutiny of the experimental results during the period 1931 to '40. Sodium nitrate, potassium sulphate and super were applied individually and in combination, with and without lime, over a basal dressing of one basket of cattle manure or leaf mould per vine in alternate years. The general mean yield of the limed series is nearly double that of the unlimed series; the beneficial effect of lime is clear. All the manures have responded well in both limed and unlimed series, the maximum yield being with nitrogen *plus* phosphoric

acid in presence of lime, closely followed within narrow limits by K + P, N + K and N + K + P, with the least response from nitrogen only (vide table XI). Experiments indicate that leaf mould (20 lb.) *plus* fish guano (¼ lb.) per vine as well as artificials [sodium nitrate (¼ lb.) potassium sulphate (¼ lb.), super (¼ lb.)] answered the requirements of pepper, generally.

TABLE XI. Response of Pepper to artificials

	Yield of green pepper on original population basis (average of 10 years)			
	Limed series		Unlimed series	
	Tolas per vine	Percentage increase	Tolas per vine	Percentage increase
No manure	5·7	—	2·2	—
Nitrogen (sodium nitrate)	8·3	45·6	4·9	122·7
Nitrogen *plus* potassium sulphate (⅛ lb.)	15·5	172·0	7·6	245·5
Nitrogen *plus* super (¼ lb.)	17·0	198·3	9·0	309·1
Potash *plus* phosphate	15·8	177·2	6·1	177·3
Nitrogen *plus* potash *plus* phosphate	8·9	56·1	6·3	181·9
General mean	71·2	—	36 1	—

Coconuts Manurial experiments on coconuts were carried out at the Coconut Research Stations, Kasaragod, and Nileshwar I and II from 1922 onwards. They mostly aimed at studying the response of coconuts to the application of organic and inorganic manures such as fish guano, cattle manure, ammonium sulphate, super phosphate, potassium sulphate etc. At Nileshwar I, where the soil is gravelly loam, the application of ammonium sulphate (4 lb) *plus* super phosphate (6 lb.) *plus* potassium sulphate (2 lb) per tree per annum gave the highest yield followed by ammonium sulphate (4 lb) *plus* potassium sulphate (2 lb) and cattle manure (100 lb). At Nileshwar II, where the soil is sandy loam the application of fish guano (10 lb) along with ashes (30 lb) was found to be the best. At Kasaragod where the soil is typical coarse sandy loam, ammonium sulphate (3 lb.) *plus* ashes (20 lb.) increased the yield of trees by as much as 69% over the yield of pre-manuring period. Cattle manure (100 lb.) and ashes (20 lb) per tree per annum were also found to be beneficial to the coconut trees. Application of fish guano (10 lb.), salt (20 lb) and lime (10 lb.) did not give significant increase in yields. It was also found during the course of these experiments that the low yielding trees responded most to manurial treatments.

In a recent experimant conducted over three years (1933—36) at Kasaragod to study the effect of organic and inorganic fertilisers applied broadcast and in trenches (6 ft. radius and one foot deep) ammonium sulphate (3 lb.) *plus* ashes (20 lb.) per tree applied broadcast was found better than the other treatments viz , cattle manure (100 lb.), ashes (20 lb) and raw fish (40 lb.) *plus* ashes (20 lb.)

TABLE XII Response of coconuts to manuring

Treatments	Average yield of nuts per tree per annum (4-year period)			
	Manure applied in trenches	% increase	applied broadcast	% increase
1. Ammonium sulphate (3 lb.) *plus* ashes (20 lb.)	58·1	37·7	75·0	77·7
2. Cattle manure (100 lb)	60·1	42 2	55·4	31 3
3 Ashes (20 lb)	55·0	30·3	44·0	4 3
4. Raw fish (40 lb.) *plus* ashes (20 lb)	51 5	22·0	—	—
5. No manure	42.2	—	—	—

(To be continued)

A Review of Some Experiments on the Eradication of Nut Grass (*Cyperus rotundus* L)

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The nut grass (*Cyperus rotundus* L.) is a formidable weed in the tropics and sub-tropics. Results of experiments on its control have been reported by Ranade and Burns, 1925 (India), Smith and Fick, 1937 (America), and Andrews, 1940 (Egypt). The morphology of the plant as described by these workers is in general as follows:- The weed possesses an elaborate underground system consisting of tubers, rhizomes and roots. Rhizomes connect the tubers with each other and from the latter are developed extensive roots The tubers are white and succulent when young but turn reddish brown and finally black with age. They consist of congested nodes and internodes with buds and scale-leaves at the nodes. The rhizomes proceeding upwards from some of the tubers produce the aerial parts of the plant consisting of rosettes of linear leaves and with the umbel-bearing scapes arising from the centre of the rosettes. At the junction of the leaves with the upward-growing rhizome is an enlargement resembling a tuber which has been termed a "basal bulb" by Ranade and Burns (l. c). Like the tuber, the basal bulb contains storage material and is capable of producing rhizomes from buds at its nodes.

Propagation Tubers and basal bulbs are the principal means of reproduction in this plant. Ranade and Burns (1 c.) found that only 1'5 per cent of the seed produced was viable. Andrews (1.c.) tried germinating the rhizomes but without success. When an underground tuber germinates it gives rise to a rhizome which may either grow upwards and produce an aerial shoot or may end in another tuber. Smith and Fick (l. c) observed that a new tuber is formed in about three weeks after an isolated tuber is planted. The first rhizome to develop from an isolated tuber grows upward and produces an aerial shoot; rhizomes formed later from either the tubers

or basal bulbs may terminate in new tubers. In a green house experiment Smith and Fick (l. c) found that 146 tubers and basal bulbs were produced from a single tuber in three and a half months.

Apical dominance Smith and Fick (l. c) have shown that an apical dominance exists in the tuber as well as in each nut grass system taken as a whole. When a tuber is planted, its terminal bud if present is the first to sprout, and the other buds develop acropetally. A number of experiments carried out by these workers have shown that in any one nut grass system only a certain number of terminal tubers produce aerial shoots, the other tubers remaining dormant Thus a count of the aerial shoots will not give a true indication of the degree of infestation in an area. The tubers that are dormant are able to produce shoots only when freed from the dominant effect of the terminal tubers This phenomenon of "apical dominance" therefore explains why cultivation frequenty *appears* to increase the infestation of nut grass in an area.

Control Measures 1. *Cultural* Ranade and Burns (l. c.) have stated that frequent cutting of the aerial parts would finally cause exhaustion and death of the tubers. Andrews (l. c.) compared nut grass systems whose aerial shoots were constantly cut with those whose shoots were allowed to grow and found that although aerial growth is necessary for the production of new tubers, frequent removal of the tops would be a long and laborious method of eradication.

Smith and Fick (l. c.) as well as Andrews (l. c.) have shown that contrary to popular belief the nut grass tuber is highly susceptible to drought and heat. Smith and Fick (l. c) found that tubers were killed by four days' exposure in the shade, the critical moisture content being 15 per cent. Tubers exposed to direct sunlight however lost their viability at a higher moisture level (about 24 per cent). In an experiment carried out during July--August (maximum temperature 35° C.) with many cloudy days and high humidity, Andrews (l. c.) obtained germination percentages of 100, 93, 47, 16, 7 and 0 with tubers exposed for 0, 1, 3, 5, 7 and 14 days respectively. It was shown by Andrews (l. c) that free tubers whether exposed on the soil surface or in a soil of low moisture content can remain alive only if they are able to obtain continuously moisture from the sub-soil. Smith and Fick (l. c) subjected tubers to varying temperatures and found that tubers were killed by an exposure of one hour at a temperature of 60° C. At 50°C it took 96 hours to kill the tubers. They concluded that although summer temperatures may have some direct detrimental effect upon the tubers, it is probable that the indirect effect of increased evaporation and consequent desiccation of the tubers is of greater importance in the destruction of tuber viability.

These observations suggest that eradication of nut grass can be accomplished if the roots of the tubers could be cut during the summer season and the tubers then left in the dry soil. Trials made by Andrews (l. c.)

in the heavy clayey cotton soil of the Gezira (Egypt) have shown that by cultivating to a depth below the level of the lower tubers (12 inches) and allowing the tubers to remain in the dry soil for one month, a nearly complete eradication of the weed could be effected in a single season. In the sandy loam soil of Norfolk (U S A.), Smith and Mayton found that the weed could be eradicated by ploughing or disking at intervals of three weeks or less throughout two successive seasons. Such treatment reduced the infestation by approximately 80 per cent in the first year. This was later tested on ten different types of soil ranging from sandy loam to plastic clay (Smith and Mayton, 1942) The results showed that a near eradication could be effected in all the soil types tested by ploughing at intervals of three weeks during two successive seasons. The authors point out that the efficiency of tillage as a means of destroying nut grass is based on the fact that in all these soils the majority of the tubers are located in the upper six inches of the soil. The only instance where satisfactory control was not obtained was one where the experiment was located on a low, poorly drained clayey soil, indicating that tillage methods may not be useful for nut grass control on areas that are likely to remain wet for lond periods.

2. *Chemical* Fumigation with chloropicrin has been shown to be very effective against nut grass by Godfrey (1939). This is however suitable only for small patches, being too expensive for application on a field scale. White (1934) recommends the application of cheap-grade salt either dry or in the form of brine to small areas at the rate of one pound per square foot. This is fit only for land not required for cultivation such as garden paths, tennis lawns etc. Fromm (1942) found that nut grass was almost completely destroyed by the application of solutions of sodium chlorate and calcium thiocyanate after the soil was turned over to a depth of 5 to 6 inches, only one per cent of the weed remaining alive after ninety days. This treatment is said to have no deleterious effects on succeeding crops.

3. *Biological* Summerwille (1933) has reported two insect enemies on nut grass in Australia, *Antonina australis* (a scale insect) and 2, a mealy bug; but these were not found to be useful in preventing the spread of the weed. Andrews (l, c.) records three fungus diseases of the aerial portion of the plant, caused by 1. *Alternaria tennissima*, 2. a species of *Physoderma* and 3. a species of *Corticum*. These diseases were more prevalent in the rainy season but no evidence was found that they could kill the plant or exercise any effective control of the spread of this weed.

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Walchandnagar—An Agri-Industrial Enterprise

By K. C. RAMAKRISHNAN

The Founder. Walchandnagar is a veritable wonderland created by Seth Hirachand Walchand from out of what was virtually a wilderness ten years back. A magnificent estate comprising 17,000 acres has been built up round about the old village Kalamb in the Sholapur district of the Bombay Presidency by this inspired millionaire, Walchand, who is better known as a shipping magnate, the builder of the Hindusthan Aircraft Factory, and the manager of the Hume Pipe Co. The latest enterprise of his is in the field of radio engineering. That such a multi-sided industrialist should take to the development of agriculture on the scale noted below would come as an agreeable surprise to most of our readers.

Soil, climate and irrigation. The soil round about Kalamb is shallow and unretentive, though of the black cotton variety. The rainfall is only 21 inches per year and the native population, exhausted by the perpetual struggle for existence, had not the energy and material resources to utilise the irrigation facilities provided from the Nira river by the Government, and went on growing poor crops, raising sugarcane and making *gur* only to the extent of Rs. 20,000 per year, while at present refined sugar is manufactured to the tune of Rs 20 lakhs in the year. Reclamation of land and rendering it fit to receive flow irrigation required Rs. 1 lakh. Drainage had to be constructed for a length of 16 miles—4 miles of it underground—to deal with the excessive moisture and correct alkalinity, a problem in all such irrigated tracts.

On behalf of Marsland Price Co. of which he is the Managing Agent, Mr. Walchand plunged into the business of sugarcane plantation on a large scale and its manufacture into refined sugar on the spot, which is necessary in the case of such a highly bulky and perishable produce as sugarcane. The immediate inspiration was the levy of heavy protective duties by the Indian legislature on sugar imported into India, guaranteed for 15 years from 1932.

Land bought and leased. He went on purchasing land at less than Rs 100 per acre from the ryots in the period of Depression ; and at present the Company owns 3,500 acres. The rest of the land, 13,000 acres, has been leased at rates varying from Rs 7 to Rs 10 per acre for the long period of 30 years. More difficulty is now felt in the purchase of ryots' lands. The Company does not wish to exercise any coercion in purchase, but by methods of persuasion acquire or lease intervening plots which not only impede construction of irrigation and drainage channels but breed pests ; and the ill-constructed and ill-kept houses are sources of epidemics that affect the population of the estate.

Power-pumping. Not content with flow irrigation from river channels the Company has recently put up a pumping plant with a 100 H. P. engine (manufactured, be it noted, by the Cooper Engineering Co., of Satara) for lifting water from the river Nira direct to the land 50 feet above.

Sugarcane Cultivation. Sugarcane is the main crop in the estate and covers at any time about 3,500 acres and the harvest lasts for about 200 days in the year, a great achievement considering the limitations of climate in the tract. After the first planted cane is cut in about 15 months or so after planting, one ratoon crop is allowed to grow, which saves a lot of labour, though there is no stinting of manure for the ratoon. The two chief varieties of cane grown in Walchandnagar are Co. 419 which is the heaviest yielder and P. O. J 2878 which is preferred by the sugar chemist for its sucrose content. Fifty per cent of the area is planted in July and harvested in 15 to 18 months after ; ten per cent is planted in November and forty per cent is ratoon crop.

The preparatory cultivation—ploughing, breaking clods, harrowing and ridging—is all done by ten 80 H. P. tractors. Human labour is employed for weeding, earthing-up, manuring and harvesting. About 1,000 acres of cane are green manured by sunnhemp which is ploughed in by disc ploughs. About 800 tons of farm yard manure are available on the estate, which is applied to about 200 acres. In pre-war days when sulphate of ammonia was available, it was applied at the rate of 4 cwt. per acre along with groundnut cake—$1\frac{1}{2}$ tons per acre. Now practically no sulphate of ammonia is applied as it has become very costly ; but instead, as much as 3 tons of groundnut cake are applied per acre of planted canes and two tons per acre of ratoons. Groundnut cake too has to be purchased at over Rs. 100 per ton, which is over 200 per cent of pre-war price.

Irrigation dues to the Government amount to Rs. 70 per acre for the whole crop, which is more than double the average rate in the ryotwari areas of the Madras Presidency, irrigated by Government works. Application of water to the land costs about Rs. 25 per acre, and harvesting and carting of canes to the light railway line—done on piece wage system—costs Rs. 45 per acre. Altogether, the cost of cultivation and harvesting amounts to Rs. 520 per acre which works out to Rs. 12 per ton of cane.

Other crops Though Walchandnagar is essentially a sugar-cane plantation, food grains particularly *jowar* (cholam), *bajra* (cumbu) and wheat—are also grown on about 2,000 acres per year The two millets are supplied to the labourers in the estate. A recent development is that of growing vegetables—European as well as Indian—on a large scale At present 600 acres are devoted to them. The yield is more than sufficient for consumption by the 1,500 families in the estate; the surplus is sold to the Military. The less lasting vegetables are dehydrated and preserved on a small scale at present; but it is to be done on a larger scale very soon. Manure is not applied to all the vegetables, as the residual effect of the lavish use of manure for sugarcane is enough to raise some splendid vegetable crops. The sweet potatoes, for instance, raised on such fields are uncommonly big in size, though they are not quite so sweet as the smaller ones we grow here.

We wonder why cotton and groundnut are not grown in the black cotton soil and groundnut kernels are imported in large quantities for the oil factory. It is a pity we had little time at our disposal for a more detailed enquiry, though the management and the staff were courteous and ready to oblige us with information.

The Dairy. Another noteworthy agricultural development in Walchandnagar is the Dairy with a milch head of 350, of which 322 are she-buffaloes of the Murrah breed and 28 are cows. There are 330 calves, 8 stud buffaloes and 3 stud bulls. The cattle sheds are well built and kept clean, but appear to be somewhat overcrowded. The yield of milk is rather poor for the herd as a whole. It is about 1,500 lb. a day. It is estimated that, on an average, only 50 per cent of the milch herd are actually in milk and thus the average yield of an animal is only $8\frac{1}{2}$ lb. per day—which is much below the average for the Murrah breed. The aim of the management is to increase the milch herd to 1,000 animals if provision for fodder could be made. The sugarcane tops provide some fodder for cattle and the cattle provide some manure for the sugarcane; but though mutually helpful neither is sufficient for the other. All the milk produced is pasteurised by a modern plant with a capacity of 1,100 lb. of milk per hour. But the milk now available is only 1 500 lb. per day. It is stated that the quantity of milk is not all consumed in the estate though there are 1,500 families there and that the surplus of pasteurised milk is sent daily by motor lorry and rail to the big consuming markets of Poona and Bombay. The standard of living of the masses of population in the estate must be low, or there must be other sources of supply of milk to them—of which we were not informed.

Co-ordination of Agriculture and Industry. The greatest claim made for Walchandnagar as a unique enterprise is that a number of industries have been built up in an agricultural and rural environment away from the din and bustle and the slum and dirt of urban areas, where generally

factories have been so far built, to the detriment both of capital and labour. It is the aim of Mr. Walchand to combine and co-ordinate agriculture and industry "so as to increase production from lands and to utilise to the utmost the products therefrom providing employment for the largest number".

Sugar industry, the pivot The sugar industry is the best instance of such co-ordination In the case of sugar it is not only desirable but necessary to have the factory in the midst or in the neighbourhood of canes as the latter are bulky (recovery of sugar being only 11 per cent at the most on the weight of canes) and perishable. The delay in the crushing of canes and boiling of juice causes rapid deterioration in the recovery of sugar. A 15 miles radius of canes round about the factory is the maximum distance manageable in India. The sugar factory in Walchandnagar is the pivot, so to say, on which everything in the estate revolves. Production of sugar is the central aim and the canes are grown to feed the factory. It started 10 years back with a crushing capacity of 150 tons of canes per day. Now it crushes 1,200 tons per day for 180 to 200 days in the year and 120 tons (1,200 bags) of sugar are bagged per day on an average. The crystals of sugar produced are bigger in size than we are used to here in South India and they are in great demand in the Bombay market.

The Distillery. The development of industries based on the by-products of sugar industry is another pet ambition of Mr. Walchand, which has been partly realised and will be pursued further, conditions favouring. The utilisation of molasses (formerly thrown away at some cost as a nuisance) in the distillery put up recently, with machinery, designed and manufactured in Bombay, is another great achievement. After a good deal of negotiations with the Government, the necessary permission was obtained to manufacture rectified spirit from out of molasses on condition that 60 percent of the product was supplied to the Government for war purposes, and only 40 percent was sold to the public for industrial purposes The daily output of rectified spirit is 1,500 gallons of 97 percent purity. Fusel oil is a by-product obtained in distillation and it is all supplied to the Government for war purposes. It is proposed to recover, in course of time, butyl alcohol, amyl alcohol, butyl acetate, amyl acetate, etc. The company has started producing yeast which will be used as cattlefood and is trying to utilise even the spent wash of the distillery for irrigating and manuring fields and to recover potash and other manurial salts from the same. In fact the chemists of the sugar factory are kept engaged in the three or four months of the off season in such experiments in the laboratory.

The Oil Factory. The oil factory which was set up in 1939, and has at present seven expellers, crushes groundnut kernels which are not produced locally but imported, makes oil and oil-cakes which are very much needed as manure for sugarcane. At least 10,000 tons of cake are needed per year, but only a third of it is produced on account of the difficulty of getting kernels by the railway. An oil refinery and hydrogenation plant have been

installed in 1941 for the production of refined oil and vegetable ghee which would satisfy the Bombay market. This plant is said to be the first of its kind designed and manufactured by Indians in India. The 'ghee' is expected to be put in the market very soon. The soap-stock after refining the oil is used in the manufacture of washing soaps, for washing glass, machinery, floor, etc. Glycerine is not recovered at present. Nor yet is any toilet soap made. An important requisite in soap making is caustic soda, which is prepared in the factory itself on a small scale and will be attempted on a larger scale by the electrolytic process later.

Scope for Paper and other by-industries. Experiments are being carried on for making wrapping paper and card-boards from sugarcane trash and stalks of cane flowers and ordinary paper from begasse and old gunny bags. A plant may soon be put up with a capacity of 2 to 3 tons of paper per day. Boot polish is sought to be made by using hydrogenated fat, cane wax etc. Brushes are already made from the hair of dairy animals. Dehydration of vegetables, which is done on a small scale at present, is to be developed. Various types of preserving vegetables and fruits are under experiment, e. g., tomato juice and *chutnies.*

A vast vista of by-industries which would utilise the by-products and engage unemployed or under-employed labour seems thus possible. But all of them put together may not employ any considerable number. Some of them are, perhaps, better carried on as home industries on a small scale rather than in factories where over head costs are bound to tell, especially if competition from foreign countries is again given free scope.

Localisation of Industries. It is, again, a common mistake to assume that any raw material can be manufactured into a finished product if only it is found in abundance, irrespective of other essential requisites for building up an industry, viz, other raw materials, power, capital, labour, market and capacity for organisation. Confining our attention to raw materials alone, the law as regards localisation of industries in relation to them is worth noting, though this is not the place to elucidate and illustrate the same. "Raw materials tend to attract industries to their place of production in inverse proportion to the amount of the raw material that enters into the final product".

Judged by this test, the strongest case is for locating a sugar factory near sugarcane plantations, as sugarcane is a bulky and highly perishable stuff and there is a lot of refuse – the begasse – which does not enter into the final product. The case is equally strong for locating a distillery near a sugar factory where the waste product—molasses—is the base for rectified spirit etc. The case is weaker for locating an oil factory near groundnut production. It is still weaker for paper, for which power is more important. It is doubtful whether even the sugar factory can stand competition of foreign sugar landed in India, once the heavy protective duties are abolished or even reduced. The selection of industries with a view to utilise raw

materials and waste materials is too ticklish a question to be decided by sentimental considerations.

Transport. Transport must be a big problem in an estate covering an area of 45 square miles. Walchandnagar is 30 miles from Diksal station on G I. P. Railway in the Madras-Bombay line and 20 miles from Baramati on the M. S M. Railway These two stations provide the main channels of communication for Walchandnagar with the outside world. Huge quantities of raw materials, especially sugarcane at the rate of about 1,200 tons per day in the crushing season, have to reach the factory and the finished products, mainly sugar at the rate of 120 tons per day and refined oil etc., have to reach Diksal, where the company has railway siding with ample storage accommodation. A narrow guage railway, rather tram line of $2\frac{1}{2}$ feet, has been laid through the entire length of the estate — 65 miles — and it involved the construction of two major and several minor bridges on the Nira and Nala rivers. Apart from this light railway, which is designed to carry a limited number of passengers in addition to goods, the company maintains a big fleet of motor lorries and buses, 23 in all, carrying goods and passenger to a distance of 45 miles—an amenity very much prized by the people in the estate and neighbourhood. It is the ambition of the company to connect Walchandnagar with Sholapur and Poona in course of time. There is a regular private telephone service in the estate which connects the main office with the six agricultural stations, and another which connects Walchandnagar with Diksal.

Technical Staff. The company has on its staff 18 agricultural graduates (not too many for 17,000 acres), 10 chemists most of whom are attached to the sugar factory and 10 mechanical engineers, some of whom are in charge of tractors All these officers are expected not only to look after routine work of the farm and the factory but also to experiment and suggest improvements—especially in the off-season. The salaries paid to the staff compare favourably with those paid by Government or any other concern for men of similar qualifications and experience. Pucca buildings have been erected to house the staff at a moderate rent.

Labour. The labour employed in the factories is about a thousand strong. Agricultural labour in the busy season is about 5,000. Altogether a labour population of about 8,000 has had to be accommodated in different parts of the colony.

Housing. Accommodation in *pucca* stone and concrete buildings has been provided for 1350 families already, and more are in the course of construction. Electric lights and flush-out latrines (one for every block of houses) and underground drainage have been provided for all quarters, labour as well as superior staff. We must, however, take leave to say that the whole housing scheme for labour has an urban and industrial rather than a rural aspect about it, because of the blocks of houses, monotonous in their uniformity and drab in their exterior without a single verandah running on any side each house being divided from the next only by walls or

asbestos sheets. The atmosphere would be really rural, not that of a *nagar* if small independent houses or cottages had been built with verandahs, running on two sides at least and open space round about, however small. Surely this would cost more to build than blocks of houses : but a garden city is nowhere a cheap affair.

Medical Aid, Education and Recreation. Medical aid—Ayurvedic as well as Allopathic—is given free to the residents and others who resort to the dispensary and hospital, which is provided with 24 beds. Free primary schools have been running in various sections of the colony and there is also a secondary school located in a fine building. Drill and physical exercises are not neglected. Boys and girls are trained to do them in accompaniment to music. Elders have their reading room and club for sports and recreations. A pucca market with 40 shops caters to the needs of residents.

Gain to the Country. There is no doubt that the country as a whole has greatly benefited by this enterprise, which is ever growing. The state has also benefited a great deal by the contributions made by the company to the coffers of the State. In 1942—43 the company paid about Rs 2·5 lakhs as irrigation dues and Rs. 10 lakhs as excise duty besides indirect contributions in the shape of railway transport charges amounting to Rs 1·3 lakhs last year. The State, of course, has been losing a little by the restriction of imports of sugar in the pursuit of the policy of protection to the sugar industry in the country.

Security and profit-sharing. The greatest criticism against this large-scale farming is that the peasant-proprietors have become wage-earners with a certain amount of subservience and risk of unemployment. Mr. Walchand says that these men were only nominally free but were really half-starved and half-clad and generally in debt, while now they receive a better income as the wages are higher (10 as. per day) and they are provided with foodstuffs at prices much lower than in the market, and above all they have "no anxieties pertaining to the land". This is not a point of view relished by peasants who prefer security and independence, though with some suffering, to doing things at the beck and call of masters. Much of the criticism will lose its force if, as Sir M Nanavati suggested, in addition to higher wages and greater security of tenure the workers were assured by the management of a share of the profits of farming, even as the workers in the estates in England, of Henry Ford and Elmhirst have been assured.

The management will do well to encourage among its employees healthy trade-unionism and co-operative organisation for the provision of credit, food-supplies, clothing etc , and the running of hotels and restaurants.

Acknowledgements. Materials for this article were collected by personal enquiries as well as from the literature supplied to delegates at the Fourth Agricultural Economic Conference held at Walchandnagar in the last week of December 1943. Details of the cost and method of cultivation

of sugarcane were ascertained by Mr. V. Srinivasan, B. Sc. Ag., (now Agricultural Demonstrator, Shiyali) who also attended the Conference.

Thanks are due to Mr. Gulab Chand (the brother of Mr. Walchand) who is at the helm of the management of the estate and took round the delegates to the farms and factories and unreservedly answered any questions asked.

SELECTED ARTICLE

Economy of Feeding Home Grown Berseem to Cattle

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Farm animals require food for growth, production of milk and performance of mechanical work over and above the amount required for the upkeep of the body. Nearly one half of the feed consumed by an animal is required for maintenance. Insufficient supply of feed naturally results either in a falling off in the production or in the conversion of body substances into products. Hence, it is hardly possible to improve the cattle only by breeding when they are not properly fed.

Requirements of cattle Food is necessary to supply energy, protein, minerals and vitamins Energy or fuel is required to maintain body temperature and to support the vital activities of the various organs; protein to repair and build up body tissues or to supply the protein of milk, minerals to form bone, maintain the mineral matter of the body or to supply the requirements of milk. Vitamins are necessary for the efficient functioning of the cells and organs of the body.

The quantity of the nutrients required depends upon the size of the animal and the amount of production expected. However, the yield of production cannot be increased beyond the maximum capacity of the animal by any amount of feed, the capacity as a producer is an individual characteristic.

It is not always possible to supply all the ingredients required only in the form of coarse and bulky fodders, such as hays and straws, as the capacity of consumption is limited. Hence concentrates (grains, oil-cakes, etc) containing the nutrients in a concentrated form are also necessary to supply the requirements within the limited capacity of intake.

The stock man should understand the requirements of his animals, also the feeding value of the feeds available in the market and what can be raised economically on his holding. Usually the farmers are recommended to feed grains and oil cakes to cattle for better production, but these high priced concentrates are not always economical. With dairy cows, the economy of feeding depends upon the production capacity of the animal. It may be profitable to give purchased feeds to a cow with heavy milk yield when the concentrates are not very high in price, but under Indian conditions where cows are usually low producers such feeds are seldom economical. Similarly for a continuous thritfy growth only a limited allowance of concentrates can be made. In such cases, legumes may provide the most economical ration. *Guar*, soybean, *urid* or *mung* during the *kharif* and *senji*, *shaftal*, lucerne and berseem in the *rabi*, season are suitable leguminous crops.

Protein rich feeds for dry months From July to November the proper feeding of cattle is easy as there is considerable growth of herbage rich in protein. In winter months the grazing is scarce and the quality of herbage available is poor. This shortage of fodder both in quantity and quality can be minimized if suitable fodder crops rich in protein such as berseem, oats or *senji* are grown. Practically no grazing is possible during April to June, the dry months preceding the monsoon. Moreover, it is difficult to have any fodder crop during this part of the year and the cattlle have to depend largely on straw Provision of feeds rich in protein is essential for this season if animals are to be maintained in proper condition ; this can be done either by purchased concentrates or by preserving some legumes as hay or silage. Legumes, if properly cured as hay or converted into silage, can always provide a good feed for cattle during the months of scarcity.

Berseem or Egyptian clover contains on an average 18 per cent crude protein and 15 per cent digestible protein on a dry basis. It is relished by cattle and as it has no injurious effect when moderately large quantities are fed, it may be used as the source of protein for reasons of economy.

A cow weighing 800 lb, and yielding 10 lb. of milk per day requires about 0·51 lb digestible protein for maintenance and 0 51 for production and is capable of consuming about 24 lb of dry matter. This total requirement of digestible protein is avilable from 34 lb. of green berseem containing about 6·8 lb. of dry matter. Thus, thougb berseem is a bulky feed, it can conveniently supplement the protein requirement.

Berseem is very rich in minerals, containing on an average about 12·7 per cent soluble ash. The calcium content is very high compared to other feeds, being about 2·8 per cent and although it is not rich in phosphates the average percentage of 0·5 is usually higher than those of other coarse fodders.

Curing of berseem as hay Excellent hay can be prepared from berseem if proper care is taken. Berseem yields a heavy crop under favourable conditions and any excess of green berseem can easily be preserved as hay. Leaves contain much more protein and minerals than the stem, and in the case of berseem the mechanical loss by shattering of leaves during hay making is important. Hence special care should be taken to prevent this loss while curing. This green stuff should be spread in thin layers, as far as possible close to the place of storage, and every morning the whole lot should be turned to expose the lower layers to the sun and stored before it is completely dry and brittle. It is always necessary to handle the stuff early in the morning,

Green berseem can yield on an average about 15 to 20 per cent hay by weight. The yield depends upon the moisture content of the green stuff. During March 1939 about 124 md. of hay were prepared from 625 md. of green berseem at Bharari Farm (Jhansi). The quality obtained was satisfactory and the loss of leaves by shattering was not large as the total protein content of the green berseem was reduced from 16 50 to 14·62 per cent only on a dry basis after conversion into hay. Hence, it may be possible to replace cencentrates also by berseem hay for the economic feeding of cattle.

The composition is not always the criterion for the true value of a feed. Marked differences are found in the efficiency of protein from different sources. Moreover, berseem is lower in energy content than grain and oil cakes and its comparative feeding value can be assessed only by the results obtained from feeding trials.

Green berseem for growing heifers To study the feeding value of berseem for growth in comparison with a mixture of barley, linseed cake and wheat bran,

heifers receiving the recommended amount of the mixture were distributed into three groups. One group was allowed to continue the regular concentrate feed; for the second group half the protein of the concentrate was replaced by an equivalent amount of berseem and for the third group three-fourths was replaced by berseem. Coarse fodder for all the animals was the same The tests were carried out with Hissar and Murrah breeds. Better growth was obtained in the group receiving the full ration of concentrates. The groups in which concentrates were replaced to the extent of 50 per cent and 75 per cent did not show any significant difference between themselves but were significantly inferior to the animals getting their full concentrate ration.

During the 17 weeks of experiment the Hissar heifers getting concentrates gained 155 lb. and those of the second and third groups increased in live weight by 122 and 125 lb. the daily gain being 1·30, 1·03 and 1·05 lb. for the three groups respectively. The total live weight increase for the Murrah heifers on the other hand, was 184, 131 and 115 lb respectively. The difference in the gain in the case of Murrahs was more pronounced than in the case of Hissars. being 1·55, 1·10 and 0·97 lb per day respectively The above results were confirmed by a similar test conducted with a large number of animals. The live weight increase with replacement of concentrates by berseem was lower than that of the animals getting an ideal concentrate ration, which might be due to the lower energy content of berseem. But the gain per day of 1·05 lb. in the case of Hissar and 0·97 lb. in the case of Murrah with the highest replacement by berseem is quite satisfactory and compares favourably with the normal growth rate of cattle.

When economy of production is taken into consideration the maximum replacement of concentrates by home grown berseem gives the best return. The average cost of the total feed for production of 100 lb. increase in live weight for both the breeds with the three different rations are Rs. 15·54, 14·00 and 11·27 respectively.

Milch cattle on green berseem Experiments on similar lines were conducted with milch cattle. One lot of cows obtained their full requirement of protein as concentrates, the second lot received it in the form of half concentrates and half green berseem and the third lot in the form of one fourth concentrates and three fourths berseem. During the period of experimant, which lasted for about four months, *the berseem rations had no detrimental effect on the conditions and general appearance of the cows and produced nearly the same quantity of milk of almost identical composition.* This test was repeated with large numbers of animals and the above findings were confirmed.

The cost of producing milk decreased with increased replacement of concentrates by berseem. The average cost of the feed for both Hissar and Murrah breeds getting the three rations was Rs. 1·55, 1·37 and 1·12 respectively per md. of milk.

The economical value of the different rations was calculated from the intake and the cost of the roughages, green berseem and concentrates fed during the experiment. The grains and oil cakes were valued at the average market price at the time of the experiments, and the cost of berseem wss arrived at from the actual cost of raising the crop on the respective farms where the experiments were conducted. For the growth test which was conducted at Madhurikund Farm (Muttra), green berseem was valued at Re. 0 118 per md. and for the milk test at Bharari Farm (Jhansi) the rate of green berseem was found to be Re. 0·144 per md. The lower cost of green berseem at Madhurikund was due to higher yield. The price of concentrates fed to heifers was Rs 2 725 per md. and of that fed to cows Rs. 2·125 per md.

Berseem hay for thrifty growth Eighteen heifers, nine Hissars and nine Murrahs were distributed into three comparable groups according to age and live weight. The average age of the Hissar heifers was about a year and a half and that of Murrahs about one year The average body weight of an animal in each group was 361 lb at the begining of the test. All the animals received wheat *bhusa* and green *jowar* for the roughage portion of the ration. One group was supplied with a mixture of linseed cake, wheat bran and crushed barley for concentrates; for the second group one half of the required concentrates was replaced by berseem hay on the basis of protein content; three fourths was similarly replaced by berseem hay for the heifers of the third group.

During the 17 weeks of experiment the total increase per animal in body-weight for the different groups was 175, 148 and 128 lb. for Hissar heifers and 187, 128 and 116 lb. for Murrah heifers for the three feeds respectively. Thus the average total increase for both the breeds was 181, 153 and 127 lb., the average gain per day being 1·52, 1·29 and 1·07 lb respectively. The increase in weight with full concentrate ration was the highest, followed by that with 50 per cent concentrate and 50 per cent berseem hay, while the gain in the group where three fourths of the concentrates was replaced by berseem hay was minimum, However this minimum increase of 1.07 lb per day with the highest replacement of concentrates compares quite favourably with the normal growth rate of cattle of the same age. It may be mentioned here that according to Morrison the gain during the second year averaged 1·16 lb. per head daily for Guernsey, 0·89 lb. for Ayrshire and 0.79 lb for Jersey.

The total expenditure on the feed was calculated to find out the comparative cost of growth by the three rations. The concentrate mixture as mentioned before was priced at Rs. 2·725, and the cost of berseem hay was found to be Rs. 0·79 per md. The price of wheat *bhusa* and green *jowar* which were common to all the animals was taken to be 8 as and 2 as per md. respectively. The average expenditure for 100 lb. gain in body weight was Rs. 13.23, 11 51 and 11.85 with the different rations, the cost with the 50 per cent replacement of concentrate by hay being minimum

Berseem hay for milk production The Murrah buffalo cows selected for this test were fed the control ration before they were distributed into three groups of comparable age, days in lactation and initial milk yield. Of the three rations compared, the control ration consisted of full concentrates as in the case of experiment for growth. The second ration consisted of half berseem hay and half concentrates to supplement the total protein requirement and the third three-fourths hay and one-fourth concentrates. The average total milk yield of a cow during 11 weeks of experiment was 15·81, 16·00 and 12·74 md. respectively. There was no difference in milk yield with the full concentrate ration and when half the concentrates were replaced by berseem hay, but the milk yield with the highest replacement was lower. No appreciable variation in the composition of milk due to the different feeds was noticed. The animals of different groups maintained their live weight quite satisfactorily. There was no difference in the general appearance and condition of the animals.

The cost of feed for the period of experiment was Rs. 31·13, 27·90 and 24·31 for the three rations and so the cost of production of milk was Rs. 1·97, 1 75 and 1·91 per md. The milk produced was quite satisfactory and economical up to the extent of 50 per cent replacement of grain and cake mixture by berseem hay.

Economy of home grown berseem For both milk and growth the cost is lower when grain mixture is replaced by green berseem. There is no significant variation in milk yield when an ideal grain and cake mixture is replaced to the extent of 75 per cent by green berseem. For growth a well balanced mixture is more efficacious than berseem, but even when 75 per cent of concentrates is replaced by berseem the average rate of growth is quite satisfactory.

The curing of berseem as hay provides an easy and economical means of supplying quite a rich feed during the dry season. Though berseem hay is not as efficacious as an ideal concentrate mixture, it is quite an efficient feed at a low cost both for growth and milk production.

When the main problem of the country is to cut down the cost of feeding cattle and at the same time to get the maximum possible return, the cultivators will act wisely if they feed enough home grown berseem to their animals with a small amount of grain or other by-products which they can spare without purchasing. *Indian Farming Vol. 4, Aug.* (1943). *

Gleanings

The more Food the Less War Commonwealth and States are united in a campaign to foster food consciousness on the part of producers, consumers and all who are in any way concerned with food consumption or production.

It is not an easy task to convince consumers that they must be prepared to do without certain foodstuffs, and suffer rationing of others.

Nor is it less difficult to continue effectively to urge the farmer to greater efforts in view of his achievements to date, and in face of the many obstacles which still remain in his path—shortages of labour, machines, materials and transport. Assurances have been given that the rate at which those obstacles are being removed will be accelerated, even if manufacturers find it less profitable to produce farm requirements than munitions.

If consumers, producers and manufacturers would accept as their slogan: "The more food, the less war", there would be less inclination than at present for consumers to complain of what are, after all, trivial inconveniences, less insistence by farmers for the total removal of all obstacles before knuckling down to the real task, and greater celerity on the part of manufacturers in changing over their operations to the now more important food front.

The old question: How are we going to win the war? has now given way to "How long will it take us to win?" The answer to this latter question depends perhaps more upon an abundance of food than upon anything else. Let us set about shortening the war by not only producing in abundance, but by voluntarily limiting civilian consumption to bare necessities, thus leaving a bigger balance to be "exchanged" with our allies for increased hitting power to batter the enemy into quick and unconditional surrender. *(Agr. Gaz. N. S. Wales, December 1943)*

Better and More nutritive Rice A process that might not only revolutionise rice milling but also be of immense benefit to the masses in India, who suffer from deficiency diseases such as 'beri-beri' is at present under examination by the Food Department of the Government of India. Under this new process, before dehulling rice is placed in a chamber treated with hot water under pressure, drained, dried and then milled in a normal manner. When milled this 'converted' rice yields a grain slightly darker than the ordinary milled rice, but of much greater nutritive value. It is claimed that this 'converted' rice is so hard that weevils are discouraged from attacking it and preliminary laboratory tests confirm this view. The hardness of the grain results in a lower percentage of broken

* [Berseem does not appear to thrive in South India, but lucerne has been known to grow well. Green lucerne is a little richer than green berseem; 100 lb. of green lucerne has 3·24 lb. of digestible crude proteins and 8·3 lb. of starch of equivalent against the respective figures 2·5, and 8·7 for berseem. *(Ed.)*]

rice in milling and this higher milling yield is sufficient to pay the cost of the operation. On account of its nutritional and keeping properties this rice ought to be of great value to India. Finally the quality of this rice is such that instead of cooking to a gummy mass it remains in separate grains.

The inventor of this new process who is at present in America, claims that simplified conversion plants suitable to conditions in India can be supplied to the hundreds of small millers in this country. The whole of the steel work can easily be manufactured in India. (*Indian Information, January 1, 1944.*)

Sugar Manufacture on Cottage Industry Scale A complete sugar making plant on a cottage industry scale has been designed at the Sugar Research and Testing Station, Bilari, working under the Director of Imperial Institute of Sugar Technology. Comprising an improved "Kolhu" two pans, four crystallisers and a pedestal centrifugal, the plant deals with 25 to 30 maunds of cane per day.

The plant can be worked by a grower with the help of his family members and bullocks. At a demonstration arranged at the Badaun Exhibition cultivators and Zamindars saw the plant manufacturing improved quality of sugar. Besides yielding a higher return for the labour involved the sugar manufactured with the help of this plant is free from excise duty as no motive power is employed in its working.

Another process for the manufacture of khandsari sugar by the open pan system evolved at the Research station gives about 1½ per cent more sugar of superior quality than that produced by the "*deolas-jji*" clarification process followed so far. The new process has been worked under commercial conditions in medium and large sized plants at the Research station and will be demonstrated to cane growers during the season. (*Indian Information, January 15, 1944.*)

Depth of Planting Cane Affects Germination The depth of soil that is used in covering seed cane can influence not only the germination and establishment of the stand of cane, but also the development of the crop during its early grown stages. Furthermore the results are not always similar when different depths of planting are used with different cane varieties or in different soils. In the experiments from which the above conclusions are deduced single eyed cuttings of each of three varieties were planted in different soils contained in small pots. The seed pieces were buried 1, 3, or 5 inches deep Viewing the experiment as a whole, there was not a highly significant difference between coverings of three inches and one inch Except in one case, a covering of five inches of soil was responsible for a greatly reduced percentage of germination. One of the two soils used had a more porous, open structure, and in this soil germination percentage was significantly better than in the other one, due, no doubt to aeration of the germinating seed piece. In all comparisions, seed of the variety 31—1939 gave a higher percentage of germination than H. 109 seed of comparable age and quality; 32--8560 also mostly germinated better than H. 109. Depth of covering the seed had a very significant effect on the average number of days before the spindles emerged from the ground. Spindles from seed covered three inches appeared three days later than from seed planted one inch deep. When five inches of soil covered the seed still another six days (for a total of 18 days) were required before the spindles appeared above the surface (under wet conditions the seed piece might rapidly decay during this 18 day period). The most rapid emergence, regardless of depth of cover was from the more open, porous soil. (*Sugar, November 1943*).

Vitamins in whole sugarcane and in sugarcane juice Great attention has been paid during the past few years to the enrichment and fortification of certain foods. The two cheapest sources of energy producing foods in the United States are cereal products and sugar. In view of the importance of sugar in the diet,

it was decided to study the vitamin content of whole sugar cane and sugar cane juice as grown in Louisiana and Cuba. Different sugar cane varieties, including mature and immature cane, were examined for their thiamine, riboflavin pantothenin acid, niacin, and boitin content. Based on each pound of sucrose in the whole mature Cuban cane stalk, and in the sugarcane juice, the vitamin content was:

	Whole cane		Juice	
	Average Mg.	Maximum Mg.	Average Mg.	Maximum Mg.
Thiamine	2·05	17·95	0·50	1·1
Riboflavin	1·1	5 7	0·215	0 4
Pantothenic acid ...	6·0	38·6	4·4	9 9
Niacin	5·3	52·25	2·0	3·3
Biotin	0·2	0·7	0·08	0·1

The corresponding figures for Louisiana cane were lower for thiamine, riboflavin, and biotin, higher for pantothenic acid, and of the same order for niacin. Whole mature sugarcane is a fair source of thiamine and riboflavin, rich in pantothenic acid, and a good source of niacin. (*Sugar, November 1943*).

High melting point butter A butter that will not melt in tropical heat has been produced by Australian research workers and is counted one of the chief food discoveries of the war. Such butter will be a blessing not only to troops, but to civilians working in hot climates. "Tropical spread", as it is known, is said to be first class butter, rich in flavour, free from chemical adulterations and unusually rich in butter fat. It spreads easily, but remains firm in spite of high summer temperatures. The "spread" is obtained by dehydrating creamery butter and extracting from it the pure butter fat which is then boiled. To it is added a small quantity of salt, skimmed milk powder and 19 per cent of hydrogenated butter fat to increase the melting point to 105°F. (*Food Manufacture, November 1943*).

Crop and Trade Reports

Statistics—Crop—Sugarcane—1943—Third or final report. The average area under sugarcane in the Madras Province during the five years ending 1941-42 represents 3 1 per cent of the total area under sugarcane in India. The area planted with sugarcane in 1943 is estimated at 147,980 acres. When compared with the corresponding estimate of 121,970 acres for the previous year and the actual area of 121,691 acres according to the Season and Crop Report, the present estimate reveals an increase of 21·3 per cent and 21·6 per cent respectively. The estimate of the previous year was greater than the actual area by 0 2 per cent. The present estimate of area exceeds the second forecast by 9,830 acres. The excess occurs mainly in Vizagapatam, Bellary, Coimbatore, Trichinopoly and Madura. The estimated area is the same as that of last year in Nellore. A decrease in area is estimated in Vizagapatam, Tinnevelly and Malabar and an increase in area in the other districts of the Province especially in Kistna (+780 acres), Bellary (+1,860 acres) Anantapur (+820 acres), South Arcot (+5,320 acres), the Central districts (+15,290 acres) and Madura (+1,450 acres). The present estimate includes an area of 10,300 acres under ratoon sugarcane in the districts of Vizagapatam (2,500 acres) East Godavari (350 acres), West Godavari (700 acres), Kistna (1,300 acres), Guntur (100 acres), Bellary (500 acres), South Arcot (2,000 acres), Chittoor (1,200 acres), Coimbatore (1,400 acres) and Trichinopoly (250 acres).

The crop had a set back in the early stages of its growth in parts of the Province due to drought. The harvest has commenced. The yield per acre is expected to be normal in West Godavari, Guntur, Nellore, Salem, Ramnad and

Tinnevelly and below the normal in the other districts. The seasonal factor for the Province as a whole is estimated at 92 per cent of the average as against 87 per cent in the previous year according to the Season and Crop Report. On this basis the yield is estimated at 3 823,970 tons of cane with a gur equivalent of 327,240 tons according to the final figures of the previous year. The present estimates reveal an increase of 26 1 per cent in the case of cane and 27·7 per cent in the case of gur as compared with the previous year.

The wholesale price of jaggery per imperial maund of 82⅔ lb. (equivalent to 3,200 tolas) as reported from important markets on 22nd January 1944 was Rs. 15—13—0 in Erode, Rs. 13—3—0 in Adoni, Rs. 12—7—0 in Cuddalore, Rs 12—3—0 in Salem, Rs. 12—2—0 in Bellary and Mangalore, Rs. 12—1—0 in Coimbatore, Rs 11—8—0 in Rajahmundry, Rs. 11—0—0 in Vizianagaram and Chittoor, Rs. 10—5—0 in Vellore, Rs 9—14—0 in Cocanada and Rs. 9—13—0 in Vizagapatam. When compared with the prices published in the last report i. e., those which prevailed on 4th December 1943, these prices reveal a rise of approximately 9 per cent in Vellore and a fall of approximately 19 per cent in Cocanada, 13 per cent in Rajahmundry, Coimbatore and Mangalore, 11 per cent in Vizagapatam, 8 per cent in Chittoor, 7 per cent in Bellary and Cuddalore and 4 per cent in Adoni, the prices remaining stationary in Vizianagaram, Salem and Erode. (*From the Commissioner of Civil Supplies, Madras*).

Statistics—Crop—Groundnut—1943—Fourth or final report The average area under groundnut in the Madras Province during the five years ending 1941-42 represents 42 4 per cent of the total area under groundnut in India. The area sown with groundnut in the Province in 1943 is estimated at 3 445 600 acres. When compared with the corresponding estimate of 3,260,000 acres for the previous year and the actual area of 3 382,128 acres according to the Season and Crop report of the previous year, the present estimate reveals an increase of 5·7 per cent and 12·9 per cent respectively. The estimated area for this year is less than the average area of 3,695,410 acres by 6 8 per cent. An increase in area is estimated in all the districts of the Province except Bellary Anantapur, Cuddapah, Nellore, Chittoor, Salem and Ramnad and is due mainly to the prevalence of high prices for groundnut. The variations are marked in Bellary (—54,200 acres) and South Arcot (+42,000 acres.)

The harvesting of the summer and early crop of groundnut concluded by the end of October The harvesting of the winter or main crop is proceeding. The yield per acre is expected to be above the normal in East Godavary (105), normal in Chittoor, Salem, Tanjore, Ramnad and Tinnevelly and below the normal in the other districts of the Province. The seasonal factor for the Province as a whole works out to 89 per cent of the average as against an estimate of 77 per cent in the Season and Crop Report of the previous year. On this basis, the yield is expected to be 1,538,200 tons of unshelled nuts as against 1.304,180 tons in the previous year, an increase of 17 9 per cent. The yield in an average year is estimated at 1,709,130 tons.

The Wholesale price of groundnut (shelled) as reported from important market centres on 8th January 1944 was Rs. 12—8—0 in Coimbatore, Rs. 11—12—0 in Erode, Rs. 11—9—0 in Vizianagaram, Rs 11—8—0 in Bellary and Guntakal, Rs. 11—5—0 in Salem, Rs. 11—1—0 in Vizagapatam, Rs. 11—0—0 in Vellore, Rs. 10-15-0 in Guntur Rs. 10—14—0 in Cuddalore and Adoni, Rs. 10—11—0 in Cuddapah. Rs. 10—9—0 in Tadpatri and Rs. 10—1—0 in Nandyal. When compared with the prices published in the last report. i.e., those which prevailed on 6th November 1943, these prices reveal a rise of approximately 5 per cent in Erode, 3 per cent in Salem, and 2 per cent in Guntakal and a fall of approximately 11 per cent in Nandyal, 10 per cent in Adoni, 9 per cent in Bellary and Cuddapah, 5 per cent in

Vizagapatam, 3 per cent in Cuddalore and 2 per cent in Vellore, the prices remaining stationary in Guntur and Vizianagaram. (*From the Commissioner of Civil Supplies, Madras.*)

Statistics—Paddy—1943-44—Intermediate report The main crop of paddy has been or is being harvested in parts of the Circars, the Deccan, Nellore, the Central districts and the South. The yield per acre is expected to be normal in West Godavari, Kurnool, Bellary, Cuddapah Nellore, Chittoor, North Arcot and Salem and below the normal in the other districts of the Province. The crop has been affected to some extent by cyclone in the northern taluks of the Vizagapatam district, by heavy rains and floods in parts of the Chingleput district, by insufficient supply of water in the Upland taluks of East Godavari, Non-Periyar tracts of Madura and in parts of Ramnad and Tinnevelly and by attacks of insect pests in parts of Kistna, Anantapur and Trichinopoly. The condition of the crop is generally satisfactory in the other districts of the Province.

The wholesale price of paddy second sort as reported from important markets on 8th January 1944 was Rs. 6—7—0 in Guntur, Rs. 6—6—0 in Mangalore, Rs. 6-5-0 in Madura, Rs. 6-3-0 in Rajahmundry, Rs 6-0-0 in Tinnevelly, Rs. 5-14-0 in Masulipatam, Rs. 5-12-0 in Bezwada, Rs. 5-9-0 in Trichinopoly, Rs 5-8-0 in Ellore, Rs 5-3-0 in Cocanada, Rs 4-15-0 in Kumbakonam, Rs. 4-14-0 in Negapatam, Rs 4-12-0 in Chittoor Rs. 4-3-0 in Cuddalore and Rs. 4-2-0 in Vellore. When compared with the prices published in the last report i. e., those which prevailed on 11th December 1943, these prices reveal a fall of approximately 38 per cent in Vellore, 22 per cent in Mangalore, 20 per cent in Madura, 12 per cent in Ellore and Cocanada, 8 per cent in Chittoor, 5 per cent in Masulipatam, 4 per cent in Rajahmundry, 3 per cent in Bezwada and Trichinopoly, and 1 per cent in Cuddalore and a rise of 2 per cent in Guntur, the prices remaining stationary in Kumbakonam, Negapatam and Tinnevelly. (*From the Commissioner of Civil Supplies, Madras*).

Statistics—Paddy—1943-44—Final Forecast Report The average area under paddy in the Madras Province during the five years ending 1941-42 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy in 1943-44 is estimated at 10,731,000 acres as against 10,394 000 acres for the corresponding period of the previous year and the finally recorded area of 10,382,419 acres in 1942-43 The present estimate exceeds the final area of the previous year by 3·4 per cent. 1,208 000 acres have been reported as sown since the last December forecast was issued; made up of 174,000 acres in the Circars, 60,000 acres in the Ceded Districts, 251,000 acres in the Carnatic, 275 000 acres in the Central Districts, 405,000 acres in the South and 43,000 in the West Coast and the Hills. The area sown in December 1943 and January 1944 was less than that sown in the corresponding period of the previous year by 43,000 acres. The area under second crop paddy is expected to be normal except in the South where the area was restricted due to the partial failure of the North-East Monsoon rains. The area is the same as that of last year in Guntur and Bellary. A decrease in area is revealed in Vizagapatam, Kurnool, Anantapur, Nellore, Chingleput, Trichinopoly and Ramnad and an increase in area in the other districts of the province. The increase in area is due partly to timely rains at the time of sowing and partly to the propaganda to grow more food crops.

The harvest of the main crop of paddy is in progress.

The crop was affected by drought or inadequate supply of water for irrigation during the growing period in parts of Vizagapatam, Upland Taluks of East Godavari and Kistna, Kurnool, Bellary, Madura, Ramnad and Tinnevelly, by attacks of insects in East Godavari, Kistna, Anantapur, Cuddapah, Chingleput and Trichinopoly, by Cyclone and floods in the northern taluks of Vizagapatam

and by heavy rains and floods in parts of Chingleput and South Kanara. The yield per acre is expected to be normal in West Godavari, Guntur, Salem and the Nilgiris and below the normal in the other districts of the Province. The seasonal factor for the Province as a whole works out to 91 per cent of the normal as against 88 per cent in the Season and Crop Report of the previous year. On this basis, the yield works out to 99,308,000 Cwt., of cleaned rice as against 91,498,000 Cwt. of cleaned rice in the final forecast of the previous year representing an increase of 8 5 per cent and 92,277 000 Cwt. of cleaned rice estimated in the Season and Crop Report of the previous year representing an increase of 7·6 per cent.

The wholesale price of paddy, second sort as reported from important markets on 5th February 1944 was Rs. 6—12—0 in Guntur, Rs. 6—1—0 in Masulipatam, Rs 6—0—0 in Tinnevelly, Rs 5—14—0 in Bezwada, Rs. 5—10—0 in Madura, Rs. 5—6—0 in Ellore, Rs. 5—5—0 in Rajahmundry and Cocanada, Rs 5—0—0 in Negapatam, Rs 4—15—0 in Kumbakonam, Rs. 4—3—0 in Cuddalore and Rs. 4—0—0 in Vellore. When compared with the prices published in the last report i.e., those which prevailed on 8th January 1944, these prices reveal a rise of about 5 per cent in Guntur, 4 per cent in Bezwada, 3 per cent in Masulipatam and Nagapatam and 2 per cent in Cocanada and a fall of about 14 per cent in Rajahmundry, 11 per cent in Madura, 3 per cent in Vellore and 2 per cent in Ellore, the prices remaining stationary in Cuddalore, Kumbakonam and Tinnevelly. (*From the Commissioner of Civil Supplies Madras*).

Statistics—Crop—Gingelly—1943—44—Third Report The average area under gingelly in the Madras Province during the five years ending 1941-42 represents 15·6 per cent of the total area under gingelly in India. The area sown with gingelly upto 25th December 1943 is estimated at 558,000 acres. When compared with the area of 592,400 acres estimated for the corresponding period of last year, it reveals a decrease of 5·8 per cent. The estimated area is the same as that of last year in South Kanara. An increase in area is estimated in the Circars (except Vizagapatam), Bellary, Nellore, Chingleput, Coimbatore and Tinnevelly and a decrease in area in the other districts of the Province.

The main crop has been harvested. The yield per acre is estimated to be normal in West Godavari, Chittoor, Salem, Ramnad, Tinnevelly and South Kanara and below the normal in the other districts of the Province. The seasonal factor for the Province as a whole works out to 90 per cent. of the average as against 83 per cent. for the corresponding period of last year. On this basis, the yield is estimated at 67,700 tons as against 67,000 tons estimated for the corresponding period of last year an increase of 1·0 per cent.

The wholesale price of gingelly as reported from important markets on 8th January 1944 was Rs. 18—13—0 in Cocanada, Rs 18—5—0 in Ellore, Rs. 17—12—0 in Cuddalore and Trichinopoly, Rs. 17—7 0 in Tinnevelly, Rs. 17—5—0 in Salem, Rs. 17—5—0 in Tuticorin, Rs. 16—14—0 in Rajahmundry, Rs. 15—1—0 in Vizagapatam and Rs. 14—5—0 in Vizianagaram. When compared with the prices which prevailed on 6th November 1943, these prices reveal a rise of approximately 17 per cent. in Cocanada, 14 per cent in Ellore, 11 per cent in Cuddalore, 10 per cent in Rajahmundry, 6 per cent in Salem and Tinnevelly, 5 per cent in Vizagapatam and 4 per cent in Vizianagaram and Tuticorin. The price remained practically stationary in Trichinopoly. (*From the Commissioner of Civil Supplies, Madras*).

Statistics—Crop—Gingelly—1943-44—Intermediate condition report Sowings of late gingelly are in progress in p rts of the Province and the condition of the standing crop is reported to be generally satisfactory in all the districts except South Arcot, Ramnad and Tinnevelly where the late sown dry crops are reported to have been affected to some extent by drought.

2. The wholesale price of gingelly as reported from important markets on 5th February 1944 was Rs. 21—1 0 in Trichinopoly, Rs. 19—5—0 in Ellore. Rs 18—5—0 in Cocanada and Rajahmundry, Rs. 17—15—0 in Tinnevelly, Rs. 17—14—0 in Tuticorin, Rs 17—12—0 in Cuddalore, Rs. 17—5—0 in Salem, Rs. 15—9—0 in Vizagapatam and Rs. 14—13—0 in Vizianagaram. When compared with the prices published in the last report, i.e., those which prevailed on 8th January 1944, these prices reveal a rise of approximately 19 per cent in Trichinopoly, 9 per cent in Rajahmundry, 5 per cent in Ellore, 4 per cent in Tuticorin and 3 per cent in Vizagapatam, Vizianagaram and Tinnevelly and a fall of approximately 3 per cent in Cocanada, the prices remaining stationary in Cuddalore and Salem. (*From the Commissioner of Civil Supplies Madras*).

Statistics—Cotton—1943-44 - Intermediate report Pickings of the mungari or early sown crop are in progress in the Bellary district and the yield is expected to be generally normal. The condition of the crop is generally satisfactory in the other districts of the Province. The average wholesale price of cotton lint as reported from important markets on 8th January 1944 was Rs. 35—6—0 for Cocanadas, Rs 32—4—0 for White Northerns Rs. 32—15—0 for Red Northerns, Rs. 25—4—0 for Westerns (mungari), Rs 26—12—0 for Westerns (hingari), Rs 71—14—0 for Coimbatore Cambodia, Rs. 58—13—0 for Coimbatore Karunganni and Rs. 38—5—0 for Nadam cotton. When compared with the prices published in the last report i. e., those which prevailed on 11th December 1943, the prices reveal a rise of approximately 6 per cent in the case of Westerns (mungari), 4 per cent in the case of Coimbatore Cambodia and 3 per cent in the cases of Coimbatore Karunganni and Nadam Cotton and a fall of approximately 7 per cent in the case of White Northerns and 5 per cent in the cases of Cocanadas and Red Northerns, the price remaining stationary in the case of Westerns (hingari). (*From the Commissioner of Civil Supplies, Madras*).

Cotton Raw, in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Province from 1st February 1943 to 28th January 1944 amounted to 432,172 bales of 400 lb. lint as against an estimate of 406,300 bales of the total crop of 1942—43. The receipts in the corresponding period of the previous year were 728,142 bales. A total quantity of 665,947 bales mainly of pressed cotton was received at spinning mills and 4,543 bales were exported by sea while 252,543 bales were imported by sea mainly from Karachi and Bombay. (*From the Director of Agriculture, Madras.*)

Mofussil News.

Agri-Horticultural Society's Flower show, Teynampet The Society held its annual show in its gardens at Teynampet on 29th and 30th January 1944. Her Excellency Lady Hope opened the show and distributed the prizes. For the first time the department took a stall and sold vegetable seeds produced at the Agricultural Research Stations. The seed packets proved very popular. About 2000 visitors including Her Excellency visited the stall and enquired about the different kinds of vegetables popularly grown in the city. The stall gave good publicity for the "Grow more vegetables", campaign of our Department. (M. S.)

Agricultural Exhibition- "Kizhur Cattle fair" Kurumbranad Taluq An Agricultural Exhibition was held in the Kizhur Higher Elementary School during the annual cattle fair from the 12th to 16th of December. 1943. The fair attracted a large number of visitors. Over 12,000 head of cattle were brought for sale. but much business did not result due to high prices. The exhibition consisted of attractive exhibits obtained from Pattambi and Paliparamba farms. Many fruit varieties were displayed. The departmental stall was very popular and the

wooden rice huller created much interest among visitors. Taking advantage of the large gathering, propaganda was done for the cultivation of food crops and for intensive manuring with groundnut cake. The Agricultural Demonstrator, Badagara, acted as one of the judges for the cattle show held under the auspices of the S. P. C. A. Prizes were distributed to the best cattle of different categories. (A. G. N.)

Exhibition at Samayapuram. An Agricultural Exhibition on a fairly large scale was held at Samayapuram during the occasion of the cattle fair from 10th to 12th January 1944. All agricultural implements of the improved type, various improved strains of paddy, millets and cotton and the several green manure seeds were put on show. Live plants of Kolinji, *daincha*, indigo and *pillipesara* were exhibited. The use of wooden grinder for hand pounding of paddy was demonstrated. A model cattle shed depicting the dry earth system and a model manure pit were erected. The bee-hive and its appliances were kept at the stall. Importance was attached to the 'Grow More Food' Campaign and posters concerning it and of raising a third crop of cumbu or pulse in wet lands were prominently hung In the evenings meetings were arranged and the gathering was addressed by the Agricultural Demonstrator, Lalgudi on "WAR" and the "National Food Drive and how ryots should help in war efforts". The Exhibition attracted a large crowd of 2000 to 3000 visitors each day. N. S.

Agricultural Exhibition at Iraniyur in Tirupathur Taluk, Ramnad District. An agricultural exhibition was conducted at Iraniyur during the Kumbabiseham Festival of the local temple from 29th January 1944 to 1st February 1944. Some of the main exhibits put up on show which attracted a large number of ryots were 'Well Balanced' and 'Ill Balanced diets', Fruit and Vegetable exhibits from the ryots, rearing of Eri Worms, specimen crops of green manure—*daincha*, *kolinji* and Sunhemp—raised in pots, Bee hive and placards and posters relating to "Grow More Food campaign." Departmental seed strains and labour saving implements were also on the show. Vegetable seeds were also distributed to the ryots. M. P. S. N.

College and Estate News

Students' Corner : *Club activities* Under the auspices of the Students' Club the following meetings were held

1. Sri P. A. Srinivasan, B. Sc. (Ag.) class III read a paper on "Systems of land tenure in Malabar" on 21-1-44. Sri A. H. Subramania Sarma, B. Sc. (Ag.) Teaching Assistant in Agriculture, presided.

2. A paper on Green manuring was read by Sri R. Narasimham, class III, on 24-1-44. Messers. K. Applanarasaiah and T. V. Rami Reddi supplemented the information on the subject. Dr S. Kasinath, B. A., Ph. D. (Lond), Assistant Agricultural Chemist, presided over the meeting,

3. Sri Rao Bahadur G. Sundaram, M. A., A. M. I E. E, Superintending Engineer, Pykara System, spoke on 'The future Economic planning" on 28-1-44. Sri S. N. Chandrasekhara Ayyar, M. A., Lecturer in Botany, occupied the chair.

4. On 8-2-44 Mr. E. Kirk, Editor of 'Life' gave a lecture on "Theosophy and Theosophical Society." Sri. S. Krishnamurthi, B. Sc. (Ag.) Farm Manager, College orchards, presided on the occasion.

Annual Essay Competition The annual essay competition was held on 25-1-44 in the Freeman Hall. The subject for the essay was 'Post-War reconstruction in India' and the length of the essay was limited to 3 pages. Messers P. A. Srinivasan, S. A. Ibrahim Ali and K. R. Narayanaswami were the successful candidates in the descending order of merit. Messers S. N. Chandrasekhara Iyer, C. S. Krishnaswami and T. Nataraj acted as judges.

Elocution Competition The elocution competition was held on 4-2-44, the subject being "Food problem in India". The following were the winners in the order of merit (1) Sri P. A. Srinivasan, class III (2) Sri K. Narasimhalu, class II, and (3) Janab S. A. Ibrahim Ali, class III. Messers K. C. Ramakrishnan, C. M. John and M. C. Cherian acted as judges.

Inter-tutorial debating contest The inter-tutorial debating contest was held on 31-1-44 The subject for the debate was "Armaments or disarmament, which will secure ever lasting place". Sri Y. G Krishna Rao's wards represented by Messers Ibrahim Ali and Thomas Reddi were declared winners. Messers H. Shiva Rao and S. N. Chandrasekharan Ayyar and Miss Bhagyam were the judges.

Games: *Inter-tutorial Matches* Cricket: Sri K. M Thomas' Wards won creditably over Sri M. C Cherian's Wards annexing Sri Rao Bahadur C. Tadulingam's Cup

Hockey Sri Y. G. Krishna Rao's Wards won over Sri K. M. Thomas' Wards claiming Krishnamurthy Rao's cup for the event.

Foot-Ball: Sri P. D Karunakar's wards secured the 'Rao Sahib V. Muthuswami Iyer's cup' by defeating Sri C. Ramaswami Nayudu's wards

Interclass matches The Parnal cup for interclass hockey tournament was won by class II after a keen contest with class III

The Victory Cup was annexed by the second year class by winning in Hockey and cricket events in the Victory cup tournament.

Award of College colours The college colours for the year were awarded to the following students for proficiency in various games and sports:-

a) Athletics–Sri K. Sundaram, class II.
b) Cricket–Sri M. Muthukumarappa class III.
c) Hockey–Sri C. V. Govindaswami, B. Sc. (Ag.)
,, V. Madhava Rao class II.
d) Foot ball–Janab Mohamed Haneefa, class I.

The Annual College Day sports: The following is the list of prize winners in the College Day sports conducted on 29-1-1944.

1. *Cross Country Race* (5 miles) The Norris Cup. 1. G. H. Sankara Reddy. 2. V. Narasimhaswami. 3. Padmanabha Nambiar, K. P.
2. *Shot put* (16 lb) 1. V. L. N. Sastry. 2. Belliappa.
3. *110 Metres Hurdles* (The Ramaswami Sivan Cup) 1. K. Sundaram. 2. M. S. Sastry.
4. *High Jump* (The Tadulingam Cup) 1 A. S. Krishnan. 2. M. S. Sastry.
5. *100 Metres Dash* (The Saidapet Old Boy's Cup) 1. K Sundaram. 2. Kollamkulam, A M.
6. *Long Jump* 1. M. Suryanarayana Sastry. 2. J. Samuel Sundararaj.
7. *200 Metres Hurdles.* 1. K. Sundaram. 2. M. Suryanarayana Sastry.
8. *Hop step and Jump* 1. A. S. Krishnan. 2. M. S. Sastry.
9. *Old Boys' Race* 1. C. V. Govindaswami. 2. Varadarajan. 3. B. S. Moorthi.
10. *400 Metres Race* 1. J. Samuel Sundararaj 2. K. Sundaram. (New Record 59 4/5 sec.)
11. *Cricket Ball Throw* 1. Balasubramanyam. 2. K. S. Alwa.
12. *1,500 Metres Race* (The Anstead Cup) 1 G. H. Sankara Reddy. 2. V. Narasimhaswami. 3. G. Kanaka Row. (New Record 5 min. 2⅘ sec.)
13. *Javelin Throw* 1. Kollamkulam, A. M. 2 T. V. Rami Reddy. 3. K. Subba Rao
14. *4 × 400 Metres Relay Race* Intertutorial (The Chunampet shield) M. C. Cherian's Wards.
15. *Tug of War* (Intertutorial) (The Ramnad Shield) M. C. Cherian's Wards.

Champion of the year 1944.—K. Sundaram, class II.

Students' Club Day The thirty-fifth Annual Club Day was celebrated on Saturday the 19th February with great success. The chief guest and president of the occasion was R. C. E. Bell Esq, I. C. S, Collector of Coimbatore. The sports in connection with the Club Day had concluded earlier on 18th February. The function began with tea at 5-15 P. M. The fancy dress competition provided mirth and amusement during tea and was much appreciated by all. After tea, the guests and students assembled in the tastefully decorated Freeman Hall and the reports of the Literary and Games sections were read by the respective secretaries. The prizes for winners in the literary competitions and sports were distributed by Mrs. W. L. Ramiah. This was followed by a pleasing variety entertainment in which large numbers of students participated. Before the entertainment concluded, the President had to leave unavoidably and hence he delivered his valedictory address before he left. The Secretary thanked the President, Mrs. W. L. Ramiah, and all others who helped to make the celebration of the Club Day a success. Again on conclusion of the entertainment, the secretary thanked the several convenors and all those who graced the occasion.

Personal On the eve of the transfer of Sri Y. G. Krishna Rao Nayudu, Senior Lecturer in Agriculture and Superint. Central Farm. Coimbatore as Dy. Director of Agriculture, Northern Division, Guntur, the students of the College arranged for a farewell 'tea'. On the same occasion they took the opportunity to welcome the in coming Senior Lecturer in Agriculture and Superintendent, Central Farm Sri C. Ramaswami Nayudu.

Departmental Notifications

Gazetted Service—Transfers and Postings

Sri N. Subramaniya Ayyar on return from leave to be D. A. O. Trichinopoly.

Sri G. Sakharama Rao D. A. O. Trichinopoly to be D. A. O. Ramanad (Sattur).

Sri M. P. Sankaran Nambiar D. A. O. Ramnad to be D. A. O. Madura.

Sri S Ramachandra Ayyar on return from leave is reposted as Officiating Assistant Entomologist, Coimbatore.

Sri V. Marghabandhu, on relief by Sri S Ramachandra Ayyar to officiate as Assistant Entomololgist under the Board of Revenue for investigation of insect pests affecting gram and pulses.

Sri G. Ganapathi Ayyar, Officiating Asst Agricultural Chemist on the expiry of special duty in Compost Scheme, to be Assistant Agricultural Chemist, Coimbatore

Sri Y. G Krishna Rao Nayudu, Officiating Senior Lecturer in Agriculture, and Superintendent, Central Farm, Coimbatore, to be Dy. Director of Agriculture Northern Division, Guntur.

Sri C. Ramaswami Nayudu, Dy. Director of Agriculture, Southern Division, Coimbatore to be Senior Lecturer in Agriculture and Superintendent, Central Farm, Coimbatore.

Sri M. Anandan, District Agricultural Officer, Tanjore to be Dy. Director of Agriculture, Southern Division, Coimbatore.

Subordainte Service—Promotions

The following consequential provisionally substantive promotions are ordered with effect from 3rd September 1941:-

Sri S. R. Srinivasa Ayyangar, A. D (on special duty) Tanjore II grade (old) to I grade (old)

Sri M. Subrahmanya Pillai, A. D. III grade (old) to II grade (old)

Sri M. P. Sankaran Nambiar, A. D. IV grade (old) to III grade (old).

Transfers and Postings

Name of officers	From	To
Sri C. Srinivasan	Probationer under training at Tiruttani	A. D. Punganur
„ M. Krishnaswami	A. D. Punganur	A. D. Madanapalli
„ H. Adisheshiah	A. D. Madanapalli	A. D. Chandragiri
„ K. Srinivasan	Probationer under training at Puttur	A. D. Puttur
„ N. V. Kalyanasudaram	A. D. Puttur	A. D. Chittor.
„ K. S. Suryanarayana	Asst. in Chemistry, Coimbatore	Assistant, Potato Manure Scheme, Ootacamund
„ P. L. Narasimham	A D. Bezwada	Marketing Asst. Bezwada
„ S. Sundaram	Cotton Assistant Coimbatore	Assistant in the Scheme of Cambodia Siruguppa cotton multiplication.
„ N. Srinivasa Rao	A. D. Gobichettipalayam	A. D. Coimbatore.
„ K. V. Natesa Ayyar	Marketing Asst. Chidambaram	A. D. Vellore
„ K. Tejappa Shetti	A. D. Kalyandrug	A. D. Anantapur
„ M. Gopala Rao	A. D. Vizianagaram	A. D. Anakapalle
„ M. Ramamurthi	A. D. Peddapur	A. D. Samalkota
„ T. K. Viswanathan	Botany Assistant A. R. S. Gudiyattam	Marketing Asst. under the Grain Purchase Officer Trichinopoly.
„ K. R. Ganesan	A. D. Saidapet	Marketing Asst. for Rice Grading, Chidambaram
„ K. P. Kuppuswami	A. D. under training Ootacamund	A. D. Gudalur
„ K. Krishnan	A. D. Gudalur	A. D on special duty Potato Manure Scheme, Ootacamund
„ D. Sreedhara Sastry,	Asst. in Mycology Guntur	A. D. Nandigama
„ S. Suryanarayana	A. D. Special duty for fruits and onion Vizagapatam	Agricultural Marketing Asst. Tadepalligudem
„ G. Ranganathaswami	A. D. on Special duty for vegetables, Vizagapatam	Food Inspector, Bhimavaram
„ B Hanumantha Rao	Agricultural Marketing Asst. Tadepalligudem	A. D. Ellore
„ K. Rama Mohana Rao	Food Inspector, Bhimavaram	Grading Asst. Gudivada
„ D. Achutharamaraju	Agricultural Marketing Asst. Guntur	Special Demonstrator for fruits and onions, Vizagapatam
„ M. Achanna Sastry	A. D. Ellore	Special Demonstrator for vegetables, Vizagapatam
„ N. K. Thomas	Botany Asst. A. R. S. Gudiyattam	A. D. Erode
„ K. Ramaswami Ayyar	A. D. Erode.	Agricultural Demonstrator Coimbatore
„ H. Narayana Kamath	A. D. Coimbatore	A. D. Dharapuram
„ Bennet P. Masila-Mani	A. D. Tirupathur	A. D. Chingleput
„ N. Ranghanathachar	A. D. Kanigiri	F. M. Aduturai
„ P. K. Sivasubrahmanyam	A. D. Peravurni	A. D. Salem Dt.

,, K. Sitharama Iyer	A. D. Attur	F. M. Palur
,, M. R. Balakrishnan	Asst. to Agrl. Chemist Siruguppa	Asst. Agrl. Chemist, Coimbatore
,, G. K. Chidambaram	Asst. to Agrl. Chemist. Coimbatore	Asst. to Agrl. Chemist, Siruguppa
Janab Sheik Hussain Sahib	Cotton Market Committee Nandyal	Cuddapah Dt.
Sri V. V. S. Varadarajan	Agricultural Upper subordinate Section	Special Officer, Tobacco Market Committee, Bezwada
,, P. S. Ananthachari	A. D. Under training Trichinopoly	A. D. under training Ariyalur
,, M. V. Baskara Rao	A. D. under taining Kaikalur	Food Inspector under Grain Purchase Officer, Tadepalligudem
,, K. Kuppamuthu	Groundnut Market Committee, Cuddalore	A. D. Shiyali

In connection with the scheme for control of *Icerya purchasi* in the Oottacamund and Coonoor Taluks of the Nilgiris District and the Kodaikanal Taluk of the Madura District, the following upper subordinates are posted to be in charge of the four plant quarantine stations noted against each:-

Sri T. V. Palaniswami	A. D. (under training) Palladam	Gudalur (Nilgiris area)
,, A. K. Nagarathanam	A. D. (under training) Polur	Mettupalayam
,, K. N. Duraiswami	A. D. Sivaganga	Shenbaganur
,, S. Krishnaswami	A. D. (under training) Tirupattur	Top Station (Kodaikanals)

Leave

Name of officers	Period of leave
Sri K. Hanumantha Rao, Asst. A. D. Adoni	L. a. p. for 2 months from 3-11-43
,, M. Gopalachetti, F. M. A. R. S. Guntur	L. a. p. on m. c. for 4 moths from 4-2-44
,, U. S. Ayyaswami Ayyar, A. D. (on leave)	L. a. p. for 2 months from 4-2-44
,, P. N. Krishnaswami Rao, Asst. in Cotton, Coimbatore	Extension of l. a. p. for 1 month from 10-2-44
,, S. Venkataraman, A. D. Nannilam	Extension of l. a p on m. c. for 2 months from 29-1-44
,, U. Achyutha Wariar, Asst. in Millets, Coimbatore	L. a. p. for 1 month from 1-2-44
,, R. Subramania Ayyar, Asst. F. M. A. R. S. Aduthurai	L a. p. for 1 month from the date of relief
,, K. Bhaskaram, Food Inspector, Tadeppallegudam	Earned leave for 8 days and extraordinary leave for 1 month and 6 days from 3-1-44
,, V. M. Ramunni Kidavu, A. D. (on leave)	Extension of l. a. p. for 2 months from 5-2-44
,, S. Varadarajan, Asst. in Chemistry, Coimbatore	L a. p. for 6 weeks from 7-2-44
,, T. V. Srinivasacharlu, Asst. A. D. Sriperumbudur	L. a. p. for 4 months and leave on half average pay for 2 months and 23 days from 1-4-44 preparatory to retirement
,, K. S. Kailasam, Offg. Asst. Entomologist, Coimbatore	L. a. p. for 1 month and 26 days from 5-2-44

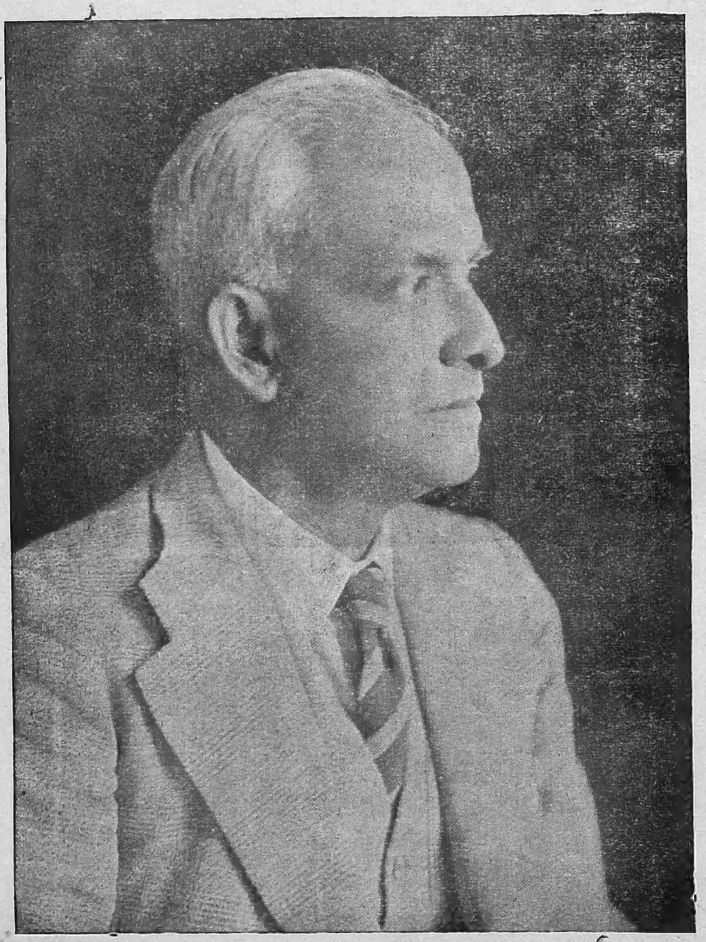
THE MADRAS AGRICULTURAL JOURNAL

NOTICE

In view of the large accumulation of the old blocks that appeared in the **MADRAS AGRICULTURAL JOURNAL**, it is proposed to sell away all the blocks. Such of the authors as are desirous of purchasing the blocks relating to their papers may do so on payment of 10 per cent. of the actual cost of preparation of the blocks, which may be ascertained from this Office on application. This offer will be kept open till the 31st March 1944. After that date, the blocks will be disposed of in the best manner that the Managing Committee may deem fit,

Manager,

Madras Agricultural Journal.



Rao Bahadur B. VISWANATH, C. I. E., D. Sc., F. I. C.,

Director of Agriculture, Madras.

(Formerly Director of the Imperial Agricultural Institute, New Delhi.)